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PLAN FOR IMPLEMENTATION OF
TOTAL QUALITY MANAGEMENT
IN THE REPUBLIC OF CHINA AIR FORCE

THESIS
Meng-chun Chao
Major, ROCAF

AFIT/GLM/LAL/93S-10

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IN THE REPUBLIC OF CHINA AIR FORCE

THESIS

Presented to the Faculty of the Graduate School of

Logistics and Acquisition Management of

the Air Force Institute of Technology

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Major, ROCAF

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Meng-chun Chao

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Abstract

The purpose of this study is to build a plan for implementation of Total Quality Management in the Republic of China Air Force. The primary TQM elements are reviewed through definitions, advantages, principles, tools and techniques, education and training, and continuous improvement.

In order to establish a TQM plan, the related experience of quality improvement in the U.S. DOD are referenced. The characteristics of ROCAF related to TQM are analyzed and related culture issues are mentioned.

The implementation plan includes four parts, top management orientation, TQM structure establishment, empowerment, and continuous improvement. A Chinese view of TQM continuous improvement models is recommended in this research.

As a result of this research, the author found that the thousands of years of traditional Chinese culture have great potential for Total Quality Management implementation, and the ROCAF should maintain and develop these valued culture assets for quality improvement.

PLAN FOR IMPLEMENTATION OF TOTAL QUALITY MANAGEMENT

IN THE REPUBLIC OF CHINA AIR FORCE

I. Introduction

Background

Quality improvement has become a force in most organizations throughout the world. The trend is not only in private business but also in public organizations as well. In 1988, the Department of Defense of the United States adopted Total Quality Management (TQM) as a strategy to continuously improve its performance at all organizational levels:

> Total Quality Management (TQM) is both philosophy and set of guiding principles that represent the foundation of a continuously improving organization. TQM is the application of quantitative methods and human resources to improve the material and services supplied to an organization, and the degree to which the needs of the customer are met now and in the future. TQM integrates fundamental management techniques, existing improving efforts, and technical tools under a disciplined approach focused on continuous improvement. (DOD, 1989:1)

Under this philosophy and its guiding principles, the American military began to implement its TQM activities in each organization. The purpose of these activities is the improvement of products and services to satisfy the organization's internal or external customers. The objectives of TQM should be accomplished by the whole

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membership of an organization along with long-term
continuous improvement efforts to develop a process that
satisfies a customer's needs (DOD 1989:1-3).

General Issue

The primary purpose of this research is to explore ways
of implementing Total Quality Management (TQM) in the
Republic of China Air Force (ROCAF). In recent years, the
ROCAF has faced great challenges from new weapon development
and old equipment maintenance; both of these need quality
management to ensure their capability. At the same time,
the U.S. DOD has been facing unprecedented defense budget
cuts which forces the need to implement quality improvements
efforts to reduce costs. The Total Quality Management
movement has made DOD a TQM leader in the U.S. federal
government. In 1988, the Secretary of Defense issued a DOD
posture Statement on Quality (see Appendix A). In 1989, the
Naval Air Systems Command was the first winner of the
President's Award for Quality and Productivity. In 1990,
four DOD organizations received the President's Council on
Management Improvement Awards. The two 1991 Quality
Improvement Prototype Awards winners and seven of the ten
finalists were from DOD. The success of the U.S. DOD gives
ROCAF a good example to plan its TQM implementation.

Specific Problem

The ROCAF has tried to improve its quality of management, but still lacks a comprehensive quality improvement process. ROCAF's aging airplanes consist of out-of-date F-5's and F-104's. With the end of the cold war, world tension decreased and many countries downsized their military organization. The Republic of China government followed this trend by substituting advanced equipment and technology to offset reductions. In 1992, the U.S. government approved a sale of 150 F-16s to the Republic of China (ROC) on Taiwan. In the meantime, Taiwan was also producing its Indigenous Defensive Fighter (IDF) as well as making another agreement for 60 French Mirage 2000-5 and 40 Israel Kfirs (Yu, 1993:2). In the short run, the ROCAF's defensive capability has increased suddenly by arms procurements. In the long run, maintaining and increasing the fighting potential of the weapons will depend on reliable quality management system. This research tries to build a plan for implementation of Total Quality Management in the Republic of China Air Force.

Objective

The objective of this research is to build a TQM implementation plan by learning from the successful TQM implementation of U.S. DOD and other similar organizations.

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The implementation plan will be based on the answers to the questions listed below.

1. What is TQM?

2. What are some advantages to be gained?

3. What lessons can be learned from those organizations which have implemented TQM?

4. What are the characteristics of ROCAF which could affect the design of a plan?

5. What are key steps in implementing the ROCAF TQM plan?

II. Methodology

Data Collection

Historical Research. The historical research method is used "to reconstruct the past systematically and objectively by collecting, evaluating, verifying, and synthesizing evidence to establish facts and reach defensible conclusions" (Isaac and Michael, 1985:45). In this research the historical method is used to define the problem and reconstruct the concepts, definitions, principles of TQM. Historical sources of TQM and related management approaches include printed documentation and film. Other sources include military publications and articles from management periodical.

Descriptive Research. The descriptive research method is used "to describe systematically the facts and characteristics of a given population or area of interest, factually and accurately" (Babbie,1986:46). The descriptive method is used to review the successful implementation of TQM in the U.S. DOD military environment and the related reference organizations. The implementation goals, strategies, planning, techniques and process are analyzed. From these successful implementation strategies, ROCAF can learn the lessons and shorten the development time of a practical quality management. The major barriers to

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TQM implementation for the ROCAF are identified and the related solutions are recommended.

Data Analysis

Content Analysis. The content analysis requires a consideration of handling of the what and the analysis of data collected in this research (Isaac and Michael, 1985:268). This analysis provides a description and interpretation of a situation or condition. This method is used to identify major themes, successful and unsuccessful strategies in the related TQM, literature and to determine trends in implementation TQM strategy.

Limitation. This research is affected by the inability to measure and validate how successful those organizations which implemented TQM have been. It is not possible for this researcher to visit each organization to see the operation of TQM and to compare differences before and after the implementation of TQM.

This research is also affected by the inability to acquire the necessary feedback from ROCAF to fine tune the implementation plan to an ideal level. Later analysis of the research by ROCAF personnel will help to improve the plan. It is more practical at this point to produce a general plan on what is known than to produce a detailed plan.

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Scope of Study

The scope of this study does not include a detailed implementation plan for each organization within ROCAF. TQM implementation guidelines are provided for ROCAF; those guidelines are presented including long range development strategy, middle range design plan and a short term implementation process.

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III. Literature Review

This literature review will offer definitions of quality and TQM, the advantages of TQM, principles of quality, tools and techniques associated with TQM, TQM in bureaucratic organization, education and training for TQM, and continuous improvement.

Definitions of Quality

There are multidimensional aspects to the definition of quality. In Deming's view, quality is "a predictable degree of uniformity and dependability at low cost and suited to the market." He recognizes that "the quality of any product or service has many scales" (Deming, 1986:169). In general, Deming believes productivity is the key determinant to measure how much the cost of a product or service is. In Juran's quality statement, he prefers the "fitness for use" as defining quality,

> To most customers, quality means those features of the product which respond to customer needs. In addition, quality means freedom from deficiencies, as well as good customer service if deficiencies do occur. One comprehensive definition for the above is "fitness for use." (Juran, 1988:3.6)

This quality concept could be expressed as product feature and quality characteristics of customers which include structural (technical) attributes (hardness, length,

frequency), sensory (psychological) attributes (taste, beauty, smell), ethical attributes (courtesy, honesty, hospitality), time-oriented attributes (reliability, maintainability, repairability) and commercial (contractual) attributes (warranty, refund, reimbursement). The customer needs and expectations decide the product's quality. The Japanese quality function deployment can be used to ensure customers' requirements are met throughout the relationship matrix between customer requirements and the counterpart characteristics. Because the relationship matrix (see Figure 1) looks a house, it is often called the House of Quality. In Figure 1, the relationship matrix of pencil is introduced.

For consumer products which are consumed promptly, two of the parameters, quality of design and quality of conformance, could be used to describe these quality characteristics. Quality is designed into the product, not acquired by inspection. Customers' needs and producers' intentions decide the grades of quality. Quality of design, from the standpoint of the market, refers to providing the product features of its own. It means these features can be used to differentiate various products in the market. Quality of conformance, however, emphasizes how precisely and accurately products meet requirements. For durable products, some time-oriented characteristics may play a part

in product quality. In general, it is obvious that good quality is user-based, which means fitness-for-use.

Japanese quality specialist, Dr. Genichhi Taguchi, has a different view on quality. He uses loss function to define quality. The loss is measured in monetary units and relates it to the language of the engineer. In other words, he defines quality as conformance to specifications. The traditional concept of conformance to specifications is treated as the "goalpost mentality" (see Figure 2). Product quality is decided by the two posts, the tolerance – upper and lower limits. The product's specifications are located between the posts and are equally acceptable and satisfactory to the customer. Those product specifications that fall outside the tolerances will be rejected by customers and result in loss. Taguchi's assumption is that the smaller the variation about the requirement the better the quality will be. He uses a quadratic function to illustrate his viewpoint (see the Figure 3). In the quadratic function, the larger deviations from the nominal specification (target) the larger losses will be.

Definition of TQM

TQM is the culture of an organization whose entire membership is totally committed to the continuous improvement which satisfies customer's needs and

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Figure 1. House of Quality

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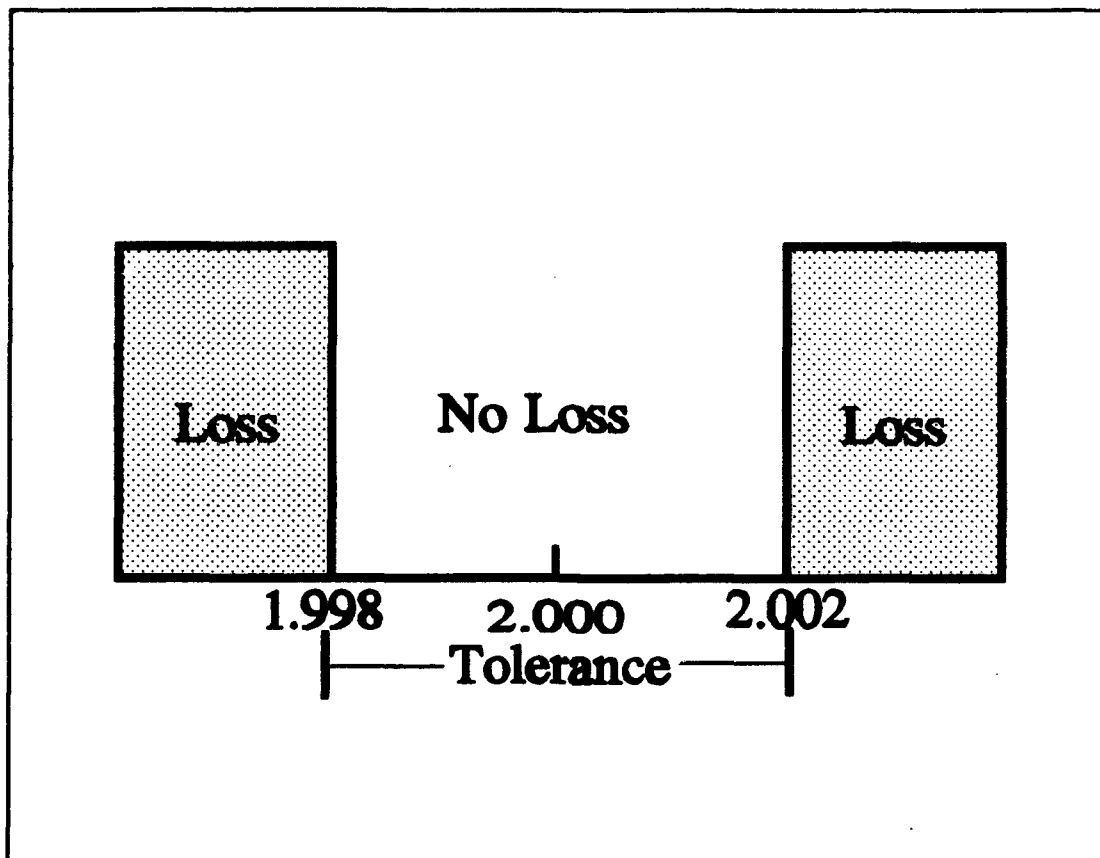
Figure 2. Traditional Conformance-to-Specification
Loss Function

expectations. This commitment is derived from top

management and is recognized by the entire work force who

dedicate their TQM management techniques and tools to

improve their work processes. The TQM culture recognizes

people as the most important resource and encourages

teamwork rather than competition in constructing working

relationships (AFMC:3a-95). The benefits of TQM include:

. better customer satisfaction

. improved quality of goods and services

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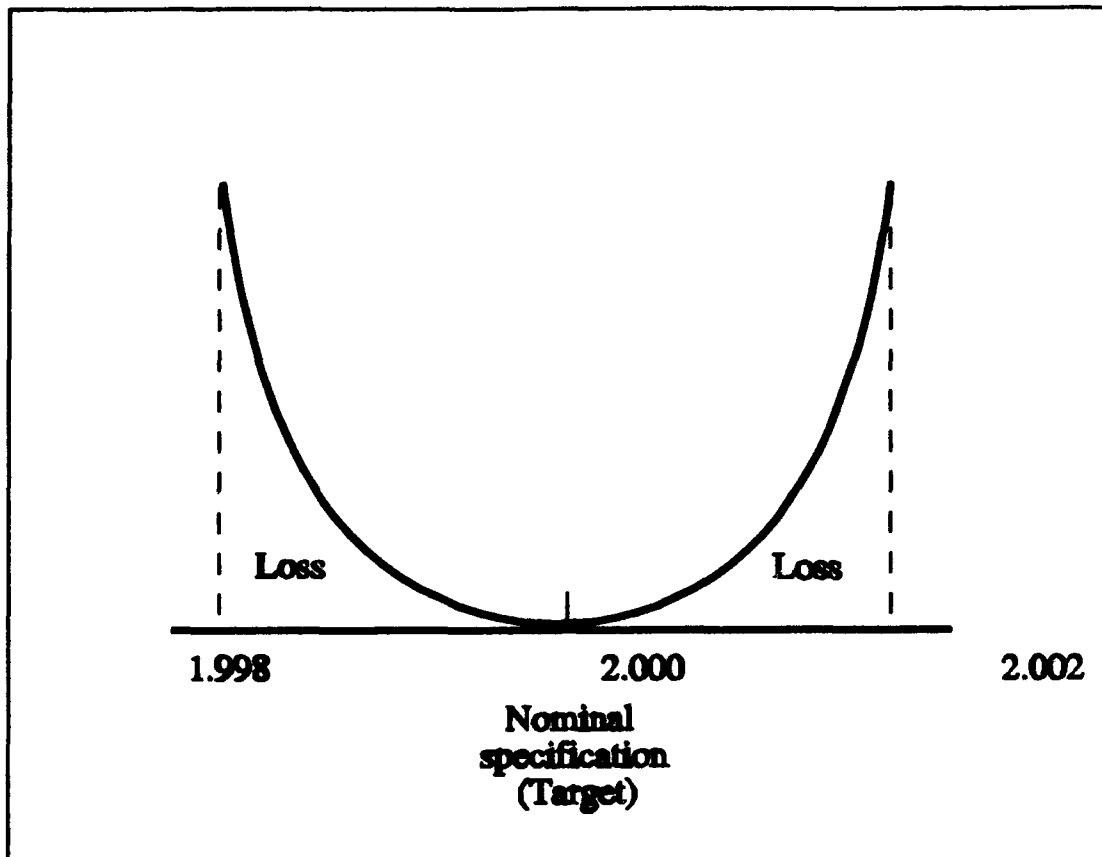
Figure 3. Taguchi Loss Function

. less waste, inventory, work in process and cost

. increased productivity

. less product development time

. increased flexibility in meeting market demands

. better utilizing human resources (Evans, 1993:103).

A. V. Feigenbaum, famous for his Total Quality Control

(TQC), was a forerunner to TQM. His definition of TQC is:

> Total quality control is an effective system for
> integrating the quality-development, quality-
> maintenance, and quality-improvement efforts of the
> various groups in an organization so as to enable
> marketing, engineering, production, and service at the

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most economical levels which allow for full customer
satisfaction. (Feigenbaum, 1991:6)

Quality performance could be affected anywhere in an

organization by anyone and affect any of its products. That

is why quality management should be practiced totally by

everyone in an organization. Feigenbaum stated that TQC's

organization-wide impact involves the managerial and

technical implementation of customer-oriented quality

activities as a prime responsibility of general management.

He said, "it permits what might be called total quality

management to cover the full scope of the product and

service 'life cycle' from product conception through

production and customer service" (Feigenbaum, 1991:14).

Feigenbaum defined characteristics of the total quality

system as follows:

1. It is a point of view for thinking about the quality

activities in an organization and how quality decisions can

be made.

2. It is the basis for the deeply thought-through

documentation, not merely a bunch of paperwork, but the

identification of the critical quality activities and the

integrated people-information relationships which make

possible viable communication throughout the firm.

3. It is the foundation for management and employees of an organization working like a team on their customer-requirements-to-customer-satisfaction quality activities.

4. It is the basis for the systematic engineering of bulk improvement throughout the major quality activities of the organization (Feigenbaum, 1991:85-86).

Advantages of Quality

In free market, adequate profit is necessary motivation for a running business. The driver of profitability is quality. In business,

Total Profit = Total Revenue - Total Cost

Total Revenue = Unit Price x Total Quantity Sold

To increase Total Profit, business either has to increase Total Revenue or decrease Total Cost. To increase Total revenue, business could increase Unit Price or increase the Quantity sold separately or simultaneously. The ability of business to increase its unit price is based on its excellent product, the quality product. The increased numbers of quantity sold is also decided by its quality product not by inferior product (Evans and Lindasy, 1993:43).

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Quality and Productivity

One thing that needs to be explained is that quality is not obtained by higher cost, it is acquired through the continuously improved process. Quality is not in conflict with productivity. Production is the process of converting the resources into products —— goods and services. Quality is completed during the production plan and process, and measured by the satisfied product user. The better view is that improved productivity is identified with improved quality products. The improved quality product is obtained by continuous improvement. The continuous improvement is acquired by honest commitment and persistent actions but not by higher cost. In general form,

Productivity = Output/Input

Output is derived from input. Inputs include land (material), labor, capital, and entrepreneurship. The traditional view of productivity is that an organization must increase material, labor, and capital in order to achieve output. A more advanced idea is that improved entrepreneurship and advanced management improve efficiency and effectiveness.

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Principles of Quality

To understand the evolution of quality, the philosophies of some gurus, such as W. Edwards Deming, Joseph Juran, and Philip Crosby are worth reviewing. Each philosopher has his own characteristics; individual organizations can apply those philosophies which fit into their own needs.

The Philosophy of Deming. The main focus of Deming's philosophy on the improvement of products and services is reducing uncertainty and variability. In order to reduce the uncertainty and variability he recommended a never-ending Deming Cycle—Plan, Do, Study, and Act— to improve the process. The Deming "chain reaction" theory expresses his view of quality. The theory states that businesses can improve the quality of their product and simultaneously decrease costs because there will be less rework, fewer mistakes, fewer delays and better use of time and materials. Better quality at lower price will also improve productivity and capture the market. Only the quality producer can stay in business and provide jobs.

Deming's Fourteen Points. The most famous Deming philosophy is outlined by his 14 points and seven deadly diseases.

1. "Create constancy of purpose for improvement of product and service."

No quality—no product. If a product does not have quality, customers will not be willing to buy it. Producers should invest capital in those facilities and equipment which can improve the quality of their products.

2. "Adopt a new philosophy."

Quality is not only the cost of product, but also an essence and added value of product. Better quality means higher profits. It should not be considered a burden on the producer. In this modern, advanced society, for an enterprise to survive and compete with the others, it should rely, not only on much capital and cheap labor, but also on excellent quality management.

3. "Cease dependence on mass inspection."

Quality does not come from mass inspection; it should be built in. A high-quality product is not decided by the number of inspections. It should be decided by the producer's commitment and persistence in designing quality into production and accomplished in the production lines. A post-mass inspection could not further improve product quality.

4. "End the practice of awarding business on the basis of the price tag alone."

Price should depend on product quality; it should not rely on cheap material cost. A big country with abundant material does not ensure production of high-quality

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products. Purchasing managers should learn that lower priced raw materials do not mean lower product cost. A lower priced raw material may result in a lower quality product. Reliable quality and stable supply of raw materials should be obtained by building strong relationships with qualified suppliers. The life cycle cost of a product should be considered in the procurement. A low-quality product may increase the life cycle cost to more than the purchasing price.

5. "Improve constantly and forever the system of production and service."

An improving process results in a continuous improvement. Continuous quality improvement is a part of the organization's culture. Only those organizations that are improving continuously can know if their improvement efforts are working on their products and customers or not.

6. "Institute training."

Training should not be limited to a worker's operational area, it should include learning about the company. A loyal employee is worth more than a million dollars. Helping workers accustomed to their environment and familiar with their job can benefit company. The more training invested in workers, the more feedback advantages will come out. A wise way is to take the employee's objectives and build on the organization's objective.

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7. "Adopt and institute leadership."

Management is not supervision, but leadership. A leader should understand his job and know how to lead his workers, so that team work can be built up and correct direction can be given to the employees. A leader not only supervises, but helps the worker to solve problems.

8. "Drive out fear."

A frightened worker may increase his product quantity, but not product quality. Do not put workers in fear, especially when the error happens in the production line. When an error occurs, blame can only make the workers attempt to avoid blame, but not help find the reason for the problem and improve operations.

9. "Break down barriers between staff areas."

Tunnel vision is the barrier between different functions in an organization, which can prevent staff communication and cause each organization to judge situations based only on their own environment. When production managers produce products based on maximum quantity and ignore feedback from customers defective products will result. A staff should not only consider his own short range performance, but also the company's whole production plan.

10. "Eliminate slogans, exhortations, and targets for the workforce."

Quality is not achieved through posters or written promises. It should be acquired through continuous improvement. The quality problem may be caused by the system. If the system is wrong, no matter how devoted the workers, their efforts will be in vain. Management should concentrate their efforts on those problems which are caused by a faulty system.

11. "Eliminate numerical quotas for the work force and numerical goals for people in management."

A work quota is a set of average numbers, but does not represent quality. If management is to emphasize numbers and ignore the creativity and potential of different workers, a higher quality product will not be created. Peer pressure will make those workers who work faster slow down to avoid criticism from the others. A numerical goal such as "decrease cost 5 percent" does not ensure the goal will be reached. What an organization needs is to design an implementing plan to achieve cost reductions. A slogan or poster will not work.

12. "Remove barriers that rob people of pride of workmanship."

Don't treat workers like a machine. Workers have sensitive feelings and expertise in their area. Pay attention to what they say, and give them pride in their work. Before management asks for performance from the

workers, it should offer an ideal work environment and the necessary tools they need. Without tools and motivation, workers are hard pressed to create good quality products.

13. "Encourage education and self-improvement for everyone."

Without improvement through education, it is hard for the workers to create a quality product. Education is a long-range investment not easily measured by quantity. Those companies that treat workers as a burden will avoid educational investments and ignore the importance of self-improvement. Only those companies that recognize the importance of a high level of knowledge can survive in the long run.

14. "Take action to accomplish the transformation."

A principle without action is just a law without power. To admit the wrong tradition and adopt a new philosophy requires wisdom and courage. A top-management commitment though seminars and other means can show the strong commitment to the people in the organization. A continuous improvement strategy is to organize people in teams with the goal of improving quality as soon as possible.

Seven Deadly Diseases. In addition to his 14 points, Deming mentions "Seven Deadly Diseases" that prevent the obtaining of quality.

1. Lack of constancy of purpose. Because most American companies are run on the quarterly dividend, most long-term goals give way to short-term goals.

2. Emphasis on short-term profits. When the emphasis is on quarterly or annual short-term performance, long-term research, education, and training suffer.

3. Evaluation of performance, merit rating, or annual review of performance. These types of performance appraisals destroy teamwork by promoting competition for limited resources. If the emphasis is on group performance, ranking should not be done on an individual basis.

4. Mobility of management. If rules are changed with each new manager, the workers will wonder what could be the next step. In the same time, mobility of labor may have the same effect on product quality because of the inability of workers to take pride in their work.

5. Running a company on visible figures alone. It is not easy to succeed if managers see only the visible figures such as payroll and taxes alone. The most important figures are unknown or unknowable factors, such as the satisfaction of a customer, the moral of workers which can not be measured easily.

6. Excessive medical costs. The extraordinarily high medical cost for employees increases the final costs of

goods and services. These medical costs, include health care and counseling of depressed people.

7. Excess costs of liability. These cost include warranty, malpractice insurance, payment for lawsuits, and judgments. (Deming, 1989:24-96).

The Juran Philosophy. In 1951, the Quality Control Handbook, known as the "bible" of quality, was completed by Juran himself. Juran prefers to improve quality by working within the system, not by making a major culture change. His quality implementation plan is designed to fit the current business strategy to get higher acceptance. His quality processes are called the quality trilogy:

. Quality planning - the process for planning to meet quality goals.

. Quality control - the process for meeting quality goal during operation.

. Quality improvement - the process for heighten performance to new level.

The Crosby Philosophy. Cosby's quality philosophy is described in his "Absolutes of Quality Management" and the "Fourteen Steps of Improvement Program."

The Absolutes of Quality.

. Quality is conformance to requirements. The requirements are demanded by customers and decided by ability of

producer. Management should clearly state the requirements to employees and provide necessary equipment too.

. There is no quality problem. Problems must be analyzed to an individual specific problem which could be identified and submitted to one specific division to solve it. The specific problems may be design problems, manufacturing problems, or front-desk problem etc.

. There is no such thing as the economics of quality; do it right the first time. He criticizes that "economics of quality" has no meaning, because quality is free. If jobs can be done right the first time there is no cost of quality.

. The only performance measurement is the cost of quality. The cost of quality is the expense of nonconformance. A well-run quality management program company can decrease cost of quality to 2.5% of sales while most companies spend 15 to 20% of their sale on quality costs.

. The only performance standard is "Zero Defects." Zero Defects standard gives people a direction, and a target to pursue. The more attention put on preventing cost the less expense of nonconformance will result.

The Crosby Fourteen Steps.

1. Management Commitment. Introduce the quality improvement concepts to management people. Communication, not motivation, can make the management understand the

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importance of defect prevention. Only communication can result in real and long-lasting understanding.

2. Quality Improvement Team. Bring together the department heads to form the quality improvement team. Only department head can commit to and orient the quality improvement program.

3. Quality Measurement. Quality does not depend on the feelings of individual workers. The company should have reliable quality measurement to know its quality status. Quality status is recorded to show where improvement is possible and the corrective action which is necessary. There are variable ways to measure operations. The workers would willing to know different measurements as variable feedbacks for improving their performance. It is seldom that a performance is too good to measure.

4. Cost of Quality Evaluation. The cost of quality is an index to detect the hidden quality problems but not an absolute performance measurement to frighten the workers.

5. Five: Quality Awareness. Company should provide visible evidence of the concern for quality improvement. The entire work force can renew their customary thought and realize the damages from cost of nonconformance through communication.

6. Corrective Action. Only if people realize the cost of nonconformance and talk about their problems can corrective

actions be applied. These problems should be examined and discussed in meetings at each level.

7. A Special Committee for the Zero Defects Program. Three or four members of the team are assigned to develop the Zero Defects concept and implement the program. The team should match the program with the company's objectives.

8. Supervisor Training. Supervisor training provides understanding of the quality concepts and skills, and the ability to explain these concepts and skills to subordinates.

9. Zero Defects Days. ZD day should not be set for vacation periods. There should be set for maximum to show the long-lasting commitment of company.

10. Goal Setting. The short, middle and long range (30-, 60- and 90- day) goal should be discussed during a meeting which is held by managers and employees. These goals should be specific and measurable goals.

11. Error Cause Removal. Individuals are encouraged to tell their problems free from threat. All they have to do is to list their problems which they could not solve. The cross-functional groups are prepared to solve those problems.

12. Recognition. Those who meet the goals for outstanding performance should be given feedback with recognition. The recognition should not be financial awards.

13. Quality Councils. Quality councils consist of professional and team chairpersons. The regular meeting should be called to review the quality program and determine necessary actions to upgrade and improve the quality program.

14. Do it Over Again. The program is never over so, employees should never give up their continuous improvement (Crosby, 1979:130-139).

TQM Tools and Techniques

TQM tools and techniques are necessary skills for the entire work force in solving their daily problems. Each organization can choose its TQM techniques, depending on the organization's characteristics. The following tools and techniques are popularly used in most TQM organizations.

Brainstorming. Brainstorming is a group technique used to stimulate a chain reaction of ideas or possible solutions to a stated problem. Brainstorming session members should suggest as many solutions as possible and should not criticize others ideas. Some rules should be obeyed:

1. Achieve quantity before quality

We must get a large number of ideas first, then we check ones that could be possible solutions.

2. Hitchhike

Anyone could be stimulated and create his new idea r.pon others' ideas. This occurs continuously until a whole series of ideas is created by an original idea.

3. Withhold judgment

All evaluation, criticism or judgement should be made after the brainstorming is over. This withholding prevents interference in the flow of ideas.

4. Free thinking

Once the leader starts his flow of ideas, the leader allows the group to continue under its own stream with little or no guidance (Cullen, 1987).

Pareto Analysis. Pareto analysis is "The 80/20 Rule." Pareto was an Italian economist and sociologist in the nineteenth century who used this method for studying the distribution of wealth in Italy. In his observation, about 80 percent of society's fortunes are held by about 20 percent of the people. Here we use it to study the distribution of causes which result in problems. Usually · the vast majority of problems can be attributed to a small minority of causes.

This rule helps the group pay attention to these important points. When a large numbers of ideas come from a brainstorming session, the rule is to go for the one that will solve the problem and cost the least. For example,

when a problem comes out, we can list all possible reasons
of the problem, and arrange the causes in order of
frequency. Then we investigate the vital few high frequency
causes first and leave the trivial many causes for later.
If the frequencies are the same, then we can add cost
factors as a basis for comparison (Schonberger and Knod,
1991:666).

For example, in analysis of customer complaints for a
large mail-order product revealed the following:

    billing errors: 867

    shipping errors: 1960

    unclear charges: 9650

    long delay: 6672

    delivery:452

If we apply Pareto Analysis (see Figure 4) we can quickly
find about 83% complaints are derived from unclear charges
and long delay. The company should spend most of their
energy on those two causes.

Ishikawa Fishbone Technique. Another TQM technique is
the fishbone diagram. It is a way of representing cause-
and-effect relationships in a diagram. The effect--the
process being studied--is represented by a line, which looks
like the backbone of the fish. Those arrows that come into
the line are the various factors contributing to the
problem.
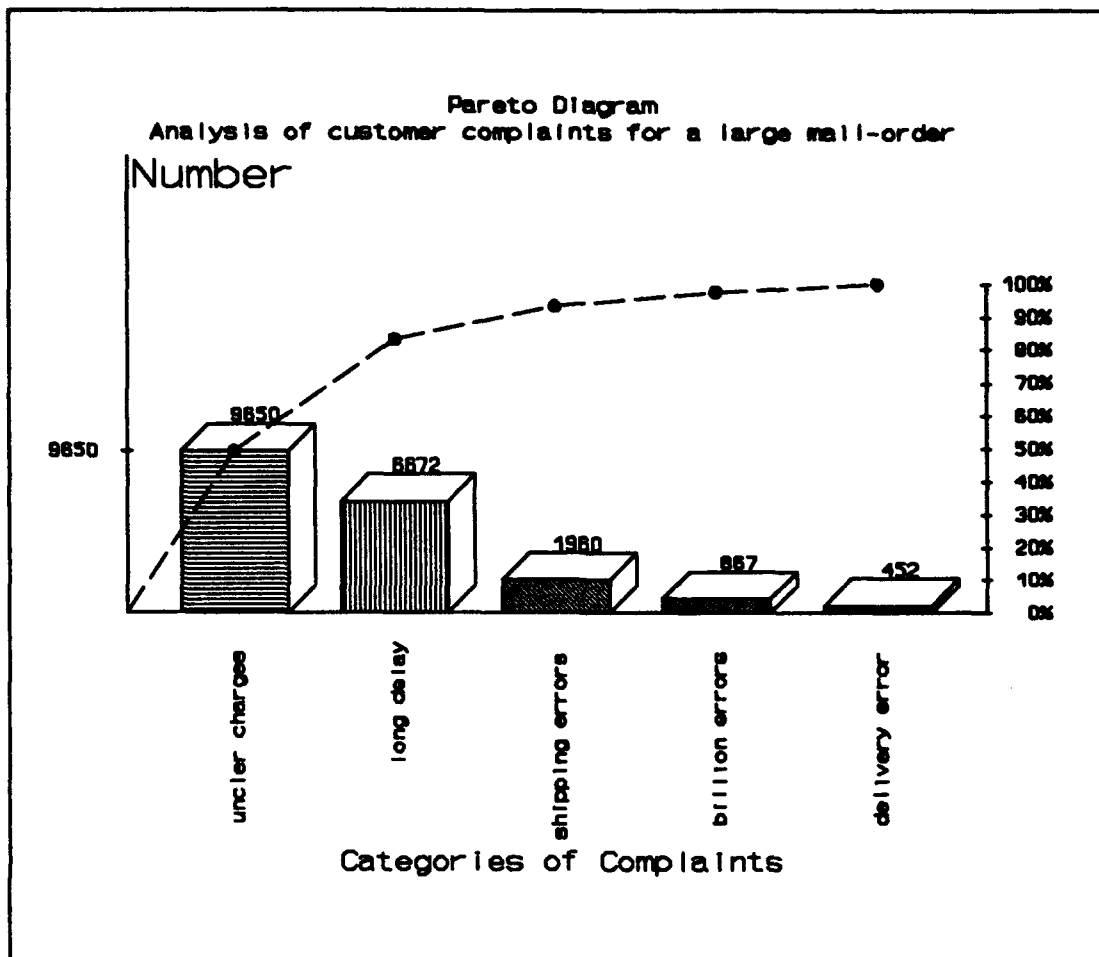
Figure 4. Pareto Diagram

The following example can explain how a student can apply fishbone diagrams (see Figure 5) to analyze the possible causes of his poor exam grade.

Scatter Diagrams. Scatter diagrams often point out the relationships between two variables. When two variables have been analyzed by cause-and-effect (fishbone) diagram, and the appropriate data of the two variables are collected, the scatter diagram of the two variables in the first

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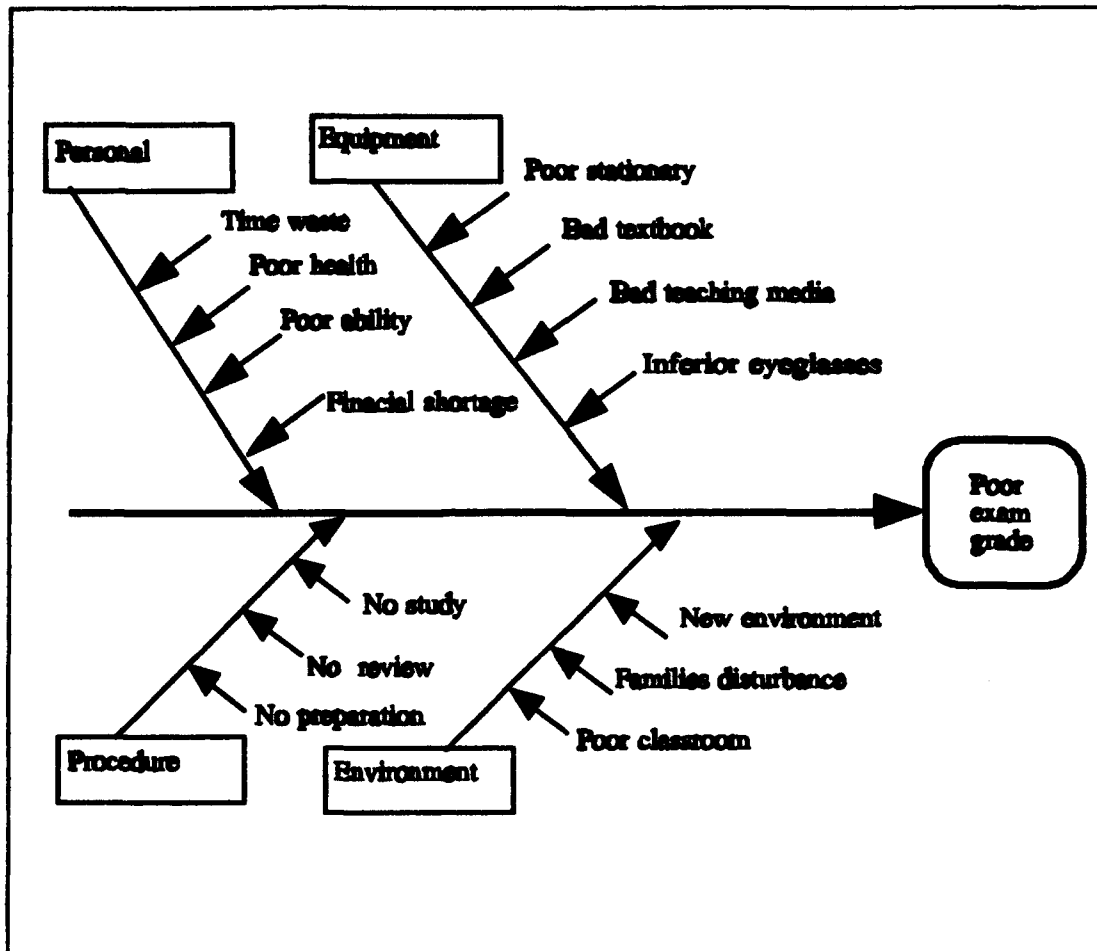
Figure 5. Fishbone Diagram

quadrant represents possible causes and effects
relationship. Statistical correlation analysis is used to
interpret scatter diagrams. Positive correlation (see
Figure 6) shows an increased variable x is related to an
increase in variable y. Negative correlation shows an
increase in variable x is related to a decrease in y. No
correlation means that there is no linear relationship
between x and y. For example, in a manufacturing process,
the production rate (parts/hour) was thought to affect the

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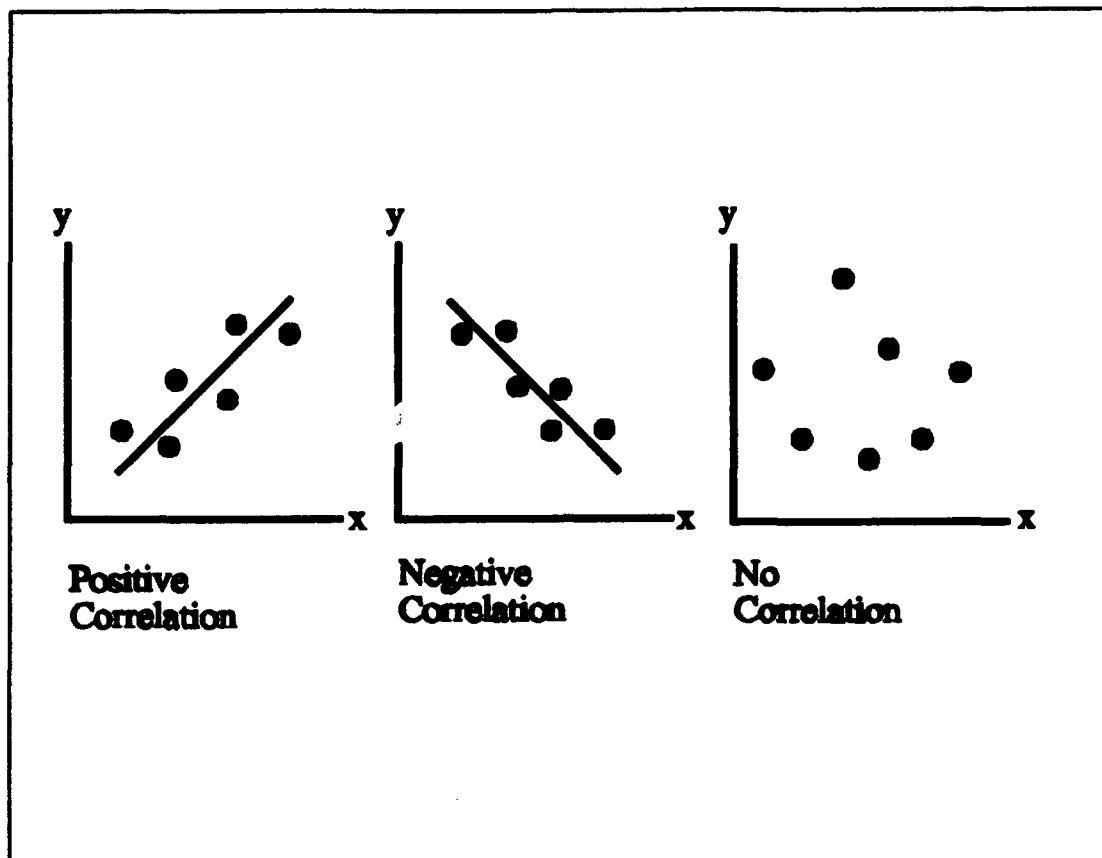
Figure 6. Three Types of Correlation

number of defectives found during a subsequent inspection.

To test this theory, the production rate was varied and the

number of defects were collected for the same batch sizes.

The results are showed in the Figure 6.

From the scatter diagram for these data, we know the

relation between the two variables is negative correlation

that means an increase in production rate is related to an

decrease in number of defects.
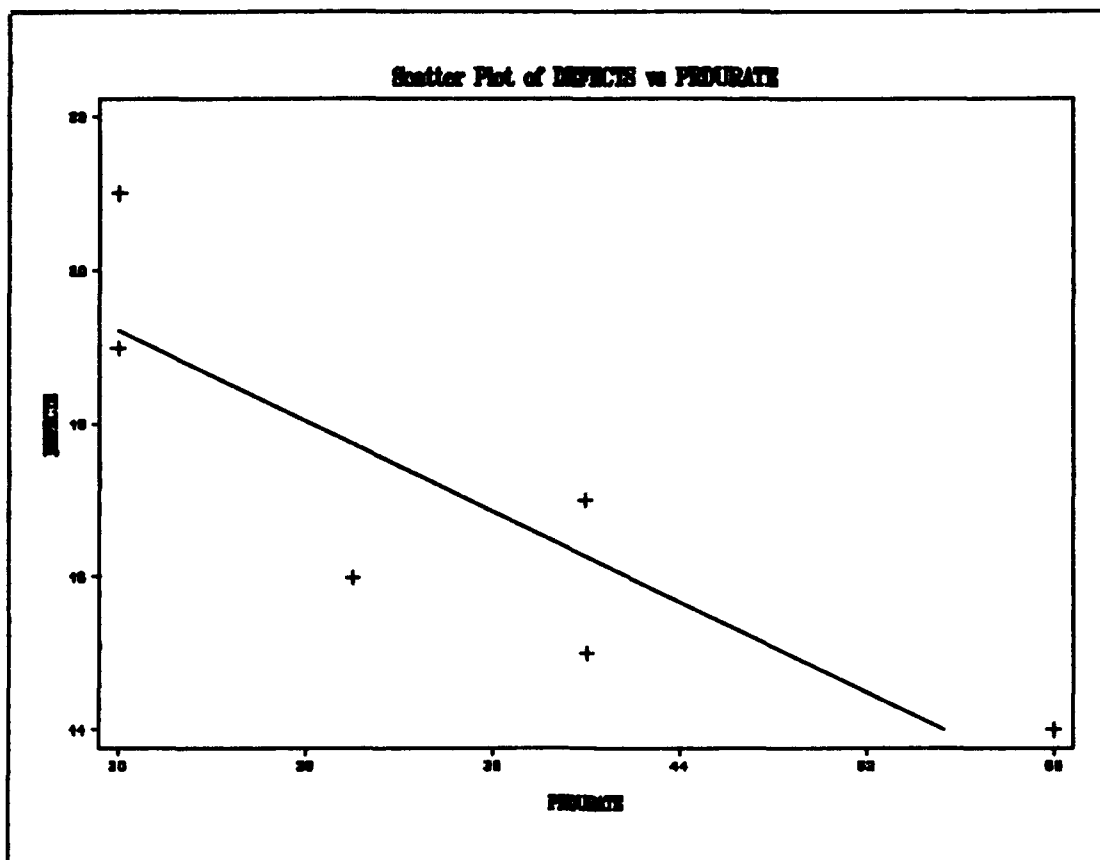
Figure 7. Scatter Diagrams

Control Chart. A Control chart is
used to study the variation in a process. The variation may
derive from common variation or special variation. Common
variation is random or chance variation which is the inher-
ent variation in a system or process which is due to chance.
Special variation is due to an assignable or specific cause.
Special variation resulting from workers usually account for
only six to 15 percent; but common causes of variation are
out of workers' control and must be the responsibility of

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management. Control charts help to point out if there are
any special causes of variation operating in a system or
process. When all special causes of variation have been
eliminated, a process is considered to be in statistical
control. Control chart including many functional charts, x
bar chart is used to track sample averages of some
measurements. R chart is used to measure sample ranges. P
chart is used to detect the defect percent in each sample
chart by plotting the number of defects (Juran, 1980:290).

For example, applying x bar- and R-charts (see Figure 8
and 9) to job performance can give a good indication of
general performance of workers. In the example on the next
two pages, ten product samples were chosen from ten workers.
The performance of nine of the workers was allocated in the
3 sigma control limits (UCL = Upper Control Limit, LCL =
Lower Control limit). In Figure 8, the tenth worker is out
of control. The manager should pay more attention to No.
10, remove handicaps from him, and give necessary support.
The payment of the people should depend on the group
performance. It should not depend on the rank within the
group.
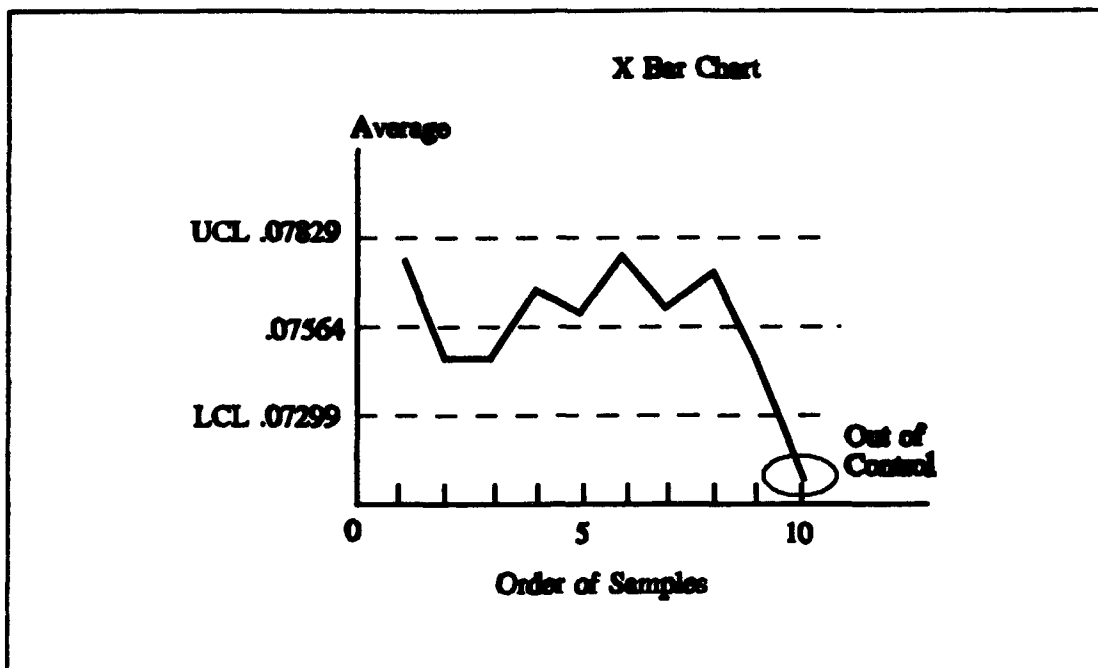
Figure 8. X Bar Chart

Figure 9. R Chart

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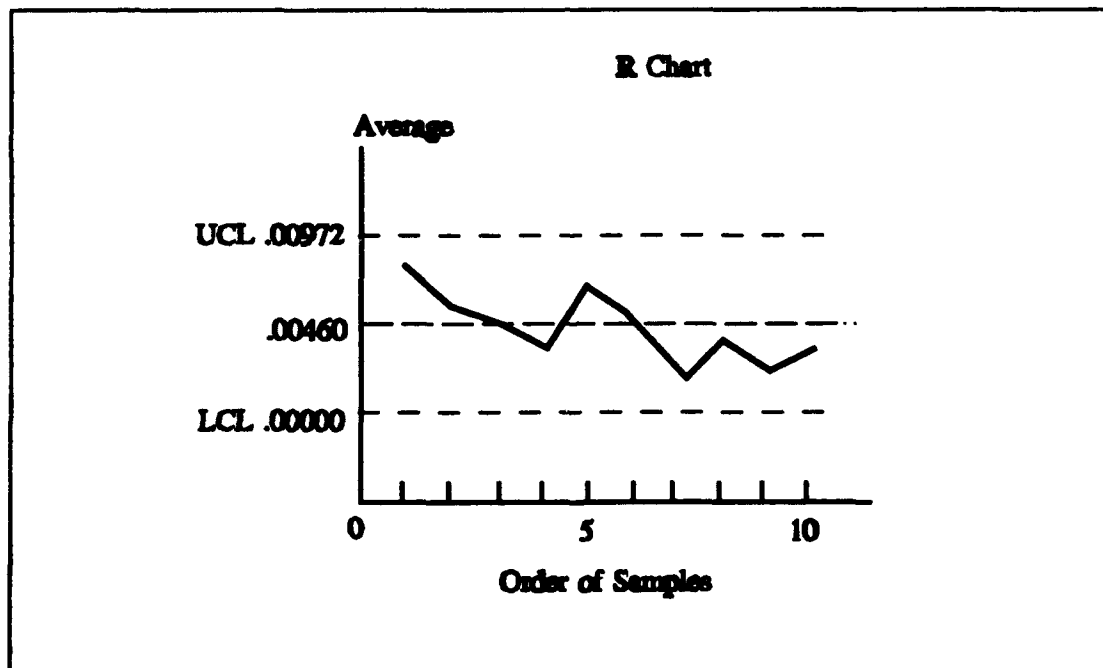
Education and Training for Total Quality Management

The reason for education and training for TQM is to empower the entire work force in an organization and ensure the customers' satisfaction is reached. The American Federal Quality Institute (FQI) has identified seven operation practices that TQM efforts should use. They are:

. Top management leadership and commitment;

. Short and long-term implementation plan;

. Focusing on customers' needs and expectations;

. Developing measurement and identifying improvement opportunities;

. Providing training and recognition to reinforce workers' positive behavior;

. Empowering workers;

. Developing TQM systems.

When an organization's competence is going down that means the production methods or something in the organization needs to be changed. When an organization is faced with change, either of two directions can be chosen. The first way is to seek external assistance to help the organization make its change. The second way can be the organization's self-ignited change. Most organizations choose to cultivate their own culture change to fit their organizational vision.

<u>Training Needs Versus Implementation Phases</u>. Because
organizations have their own specific missions, the focus of
their training needs should differ, as well. In the early
TQM implementation stage the top management awareness and
commitment are most important. As the TQM is started, the
organization's top leader should develop a vision though
leadership. During the implementation stages, the team
activities and qualities should be integrated with its
planning. The final target is to confirm the requirements
of customers. Table 1 shows the kinds of training needs
that many organizations have at their TQM implementation
stages.

<u>Priority and Funding for TQM Training</u>. In order to
assure the success of TQM, the priority of training is
number one. Because the culture change, new perceptions,
new techniques are transplanted by education. The time
invested in training will result in improved process and
shorter production time. Without continuous and advanced
training the continuous improvement can hardly be reached.
In the Federal Quality Institute's interview with advanced
TQM organizations that budget amount is not seriously
impediment for TQM. However, Malcolm Baldrige Award winners
allocate 10 percent or more of their payroll to training.
The winner of the 1992 Presidential Award for Quality, Ogden

TABLE 1

Summary of TQM Education and Training Needs

During Phases of TQM Implementation

PHASES OF TQM IMPLEMENTATION	TYPICAL EDUCATION AND TRAINING NEEDS
Phase I - Deciding whether to implement TQM. Top executives are actively considering whether to embark on a TQM effort.	Awareness training for top management team. Reading and video viewing by top management team. Attendance at conferences and external training seminars.
Phase 2 - Getting Started. Top leadership has made a formal decision to embark upon a TQM effort. This phase usually lasts about a year, and frequently consists of: establishing a quality council, developing a vision, assessing the organization's readiness and culture, reviewing the TQM training needs, developing an initial TQM implementation plan, and beginning some initial TQM education and training.	Quality leadership training for top managers. Orientation or awareness for mid-level managers, supervisors and non-management employees. Site visits to exemplary TQM organizations. In-depth training for the quality coordinator. Begin training of managers and supervisors to conduct orientation and awareness training for work force. Begin training internal trainers, facilitators and team leaders.
Phase 3 - Implementation. Some specific results are being realized by the adoption of TQM-related processes, such as formal establishment of quality teams, identification of internal and external customers, analysis of systems and processes in order to streamline operations, and adoption of significant new policies designed to further quality management principles.	complete orientation of work force. Leadership training for managers, supervisors, and union leaders. Training of team leaders and team members as they are assigned to quality teams. Continue training of internal trainers and facilitators. Limited training in more advanced TQM subjects such as Hoshin Planning, bench-marking, Quality Function Deployment, and statistical process control.
Phase 4 - Achieving Widespread Results. The organization is beginning to realize systemic, cross-functional and/or organization-wide achievements resulting from the TQM effort	Advanced statistical analysis of complex processes. Training in advanced TQM techniques such as Hoshin planing, benchmarking, and Quality Function Deployment Integration of TQM concepts in all supervisor and leadership training.

(Federal Quality Institute 1992:8)

Internal Revenue Service Center (OSC), also spent $5.6 million, 5.9 percent of the total payroll, on skills training and quality education, compared to about .5 percent in most Federal agencies.

TQM Training Program. As the needs of different organizations vary, the TQM subject areas and training courses are different too. TQM beginners can benchmark similar successful organizations for deciding their own TQM subjects and training courses.

Subjects of TQM Training. The following subject areas and training courses are practiced in many organizations.

Introduction of TQM. The abrupt implementation of TQM in an organization may stimulate resistance easily. To arouse employees' attention, the success stories of other peer TQM companies need to be introduced. How they established their TQM procedures and built their TQM infrastructures present good examples for us to learn.

Leadership and Organization Change. Leadership is a main factor which affects the success of TQM planing in an organization. Leaders should change their monitoring role to a coaching role. Leaders' attitudes and decisiveness will affect workers' willing and confidence immensely. Leaders should build mutual trust with their

subordinates and respect their skills. In TQM organization, many activities are done by cooperation not by competition among divisions. Leaders should learn how to coordinate each division to work like teams but not competitors. The competitive culture among divisions should be changed to cooperative culture.

Group Problem Solving. TQM organizations build levels of teams to solve problems together. Group decision making is comparatively slower and more complex than individual decision. Without learning group problem solving techniques, group discussion may not be efficient or effective. During the discussion, workers should learn how to accept opinions and share success with others. When an individual's suggestion has tremendous advantages or critical value, the group should not deny his viewpoint.

Customer Focus. Customers are the judges of products or services. Organizations should focus on their customers' needs. Without considering the needs of customers the organization will lose its business. Customers may be identified as external and internal customers. Those workers who work downstream are internal customers. How to satisfy our external customers and cooperate with our internal customers requires skill.

Training Courses. Once the subject areas of TQM training are decided, the training courses could be decided

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upon too. Each subject area includes different training courses, here we introduce some common topics for discussing.

Orientation and Awareness. In the orientation course, the organization introduces the entire work force to basic TQM concepts and approaches in two to four hour lectures. One to three day awareness courses, including history, philosophy, concepts, principles and tools of TQM, are introduced to employees. In the practices of these courses, top management orientation is first. After top management decides to implement TQM in their organization, managers and workers receive training later.

Quality Team Training. Quality teams may includes Quality Improvement Teams or Process Action Teams. The ultimate purpose is to organize entire work force as a coordinate team. Quality teams show a vivid change in TQM organization, a new form of teams at least show the visual decision of top management commitment to the entire work force. When cross-function workers work together to solve a specific problem the solutions may evaluate and accepted by many divisions. Team members may spend three-to-five days in TQM tools and techniques training. Team leaders need more time to received advanced training in leadership and management techniques.

Facilitator (Quality Advisor) Training.

Facilitators help team leaders to organize teams to reach the team's objectives. Facilitator training often requires one or two weeks for participants to became familiar with TQM concepts and techniques. The training course enables facilitators to handle the interpersonal dynamics. The facilitator and team leaders are the primary trainers of the team members.

Instructor Training.

Instructor Training. Instructors could be hired from external sources or cultivated in house. If organizations intend and are able to create instructors from their own employees, the instructors could be chosen from team leader and top leaders. Some organizations provide them the same instructor training courses while the others offer separate courses. The instructor training courses for top leaders focus on leadership, culture change, TQM planning, and the theory and concepts of TQM. If top leaders could use statistical theories and tools in training statistical process control in organization would be improved. Table 2 summarizes various training for varies groups by FQI.

TABLE 2
Depth of Learning for Groups of Employees

SUBJECTS	Top Manage-ment	Mid-level Managers	Non-supervisors	Union Leaders	Union Rank & File
Introduction	B	B	B	B	B
Leadership/ Change	C/B	B	B	B	B
Group Problem Solving	C/B	B	B	B	B
Analytic Tools	C/B	B	B	B	B
Planning	B	B	C	B	C
Group Dynamics	B	B	B	B	B
COURSES					
Orientation	A	A	B	B	B
Awareness	A	A	B/A	B	B
Team Member	C	B	B	B	B
Team Leader	C/B	B	B/C	B	B
Facilitator	C	C/B	B	B	B
Instructor	C	B	B	B	B

Depth of Learning Code:
C : Introduced to basic concepts
B : In-depth for actual use
A : Ability to train others
(Federal Total Quality Management Handbook, 1993:25)

Continuous Improvement

In Japanese total quality control continuous

improvement is performed as kaizen (improvement). Kaizen

means continuing improvement in personal life, home life,

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social life, and working life. The application of Kaizen in
workplace means continuous improvement involving everyone –
managers and workers alike (Imai,1986:xx).   When the kaizen
concept is applied to job improvement the kaizen action just
fits into the gap between innovation and daily maintenance.
The following figures (Figures 10 and Figure 11) describe
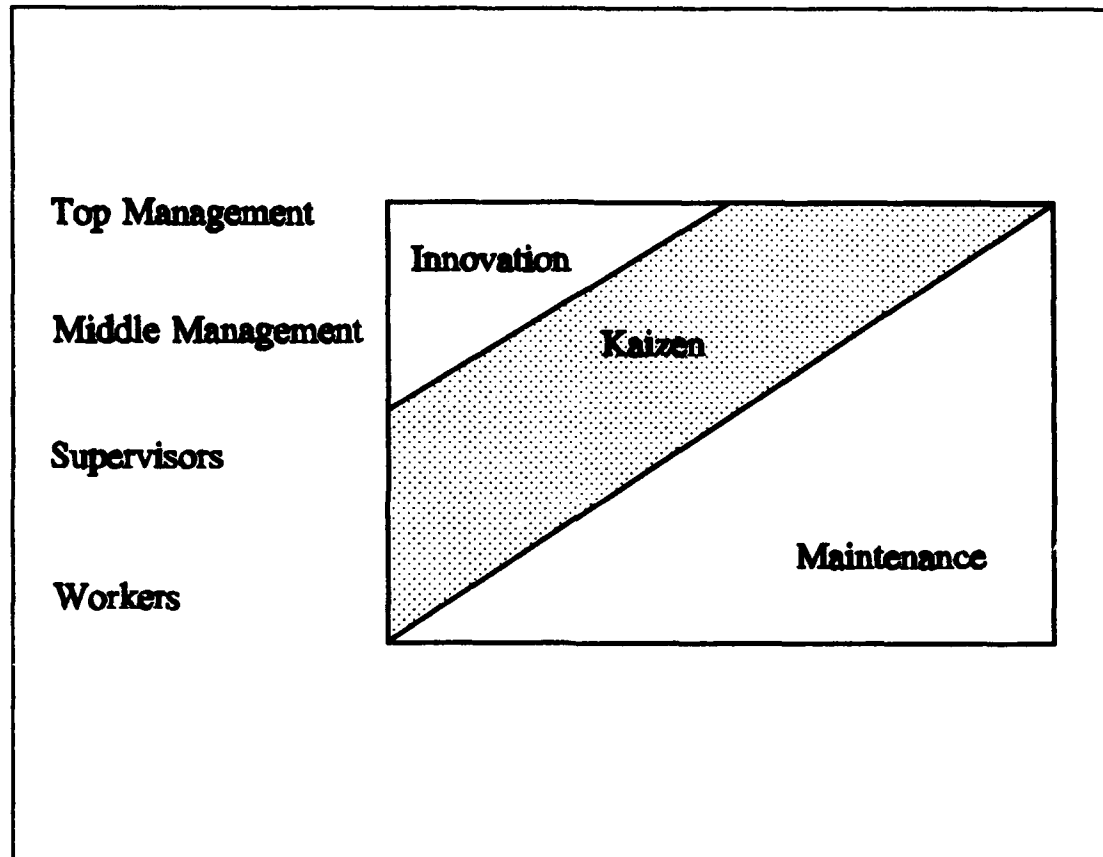
Figure 10.   Japanese Perceptions of Job Functions (Imai,
1986:7)

the different perceptions between Japanese kaizen and
Western management. When organizations try to improve
standards, two ways can be relied on. One way is innovation

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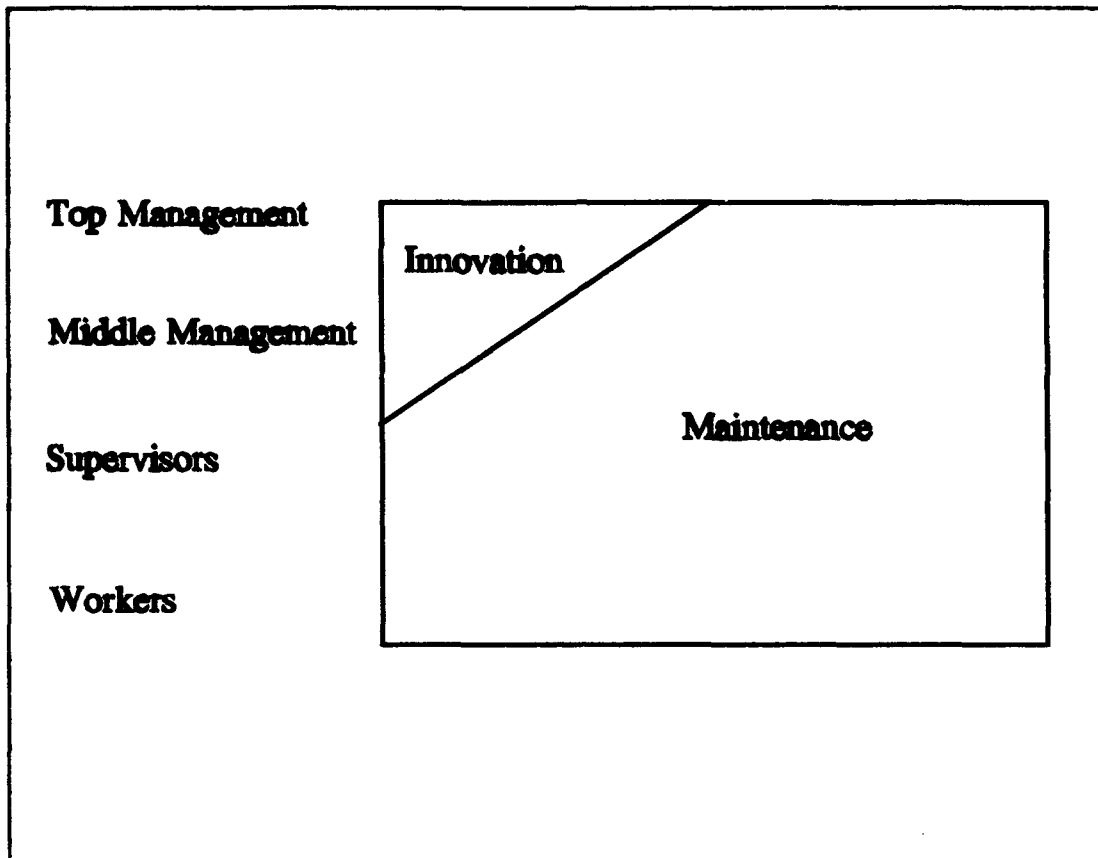
Figure 11. Western Perceptions of Job Functions (Imai, 1986:7)

and the other is kaizen. From a Western management view, innovation is the fastest way to acquire improvement, but it needs lots of investment. From the Japanese managers' perceptions, instead of spending lots of money and time on uncertainty, they prefer accumulated "small wins" to a "big win". The following figures (Figure 12 and 13) describe the different results from the different perceptions.
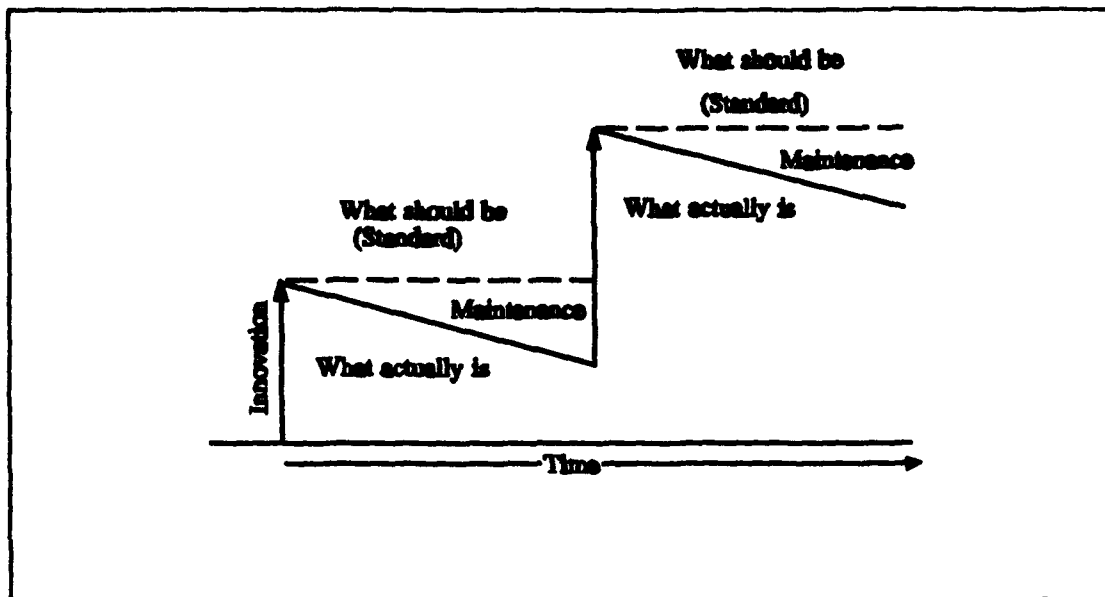
Figure 12. The Result of Innovation Alone (Imai, 1986:26)
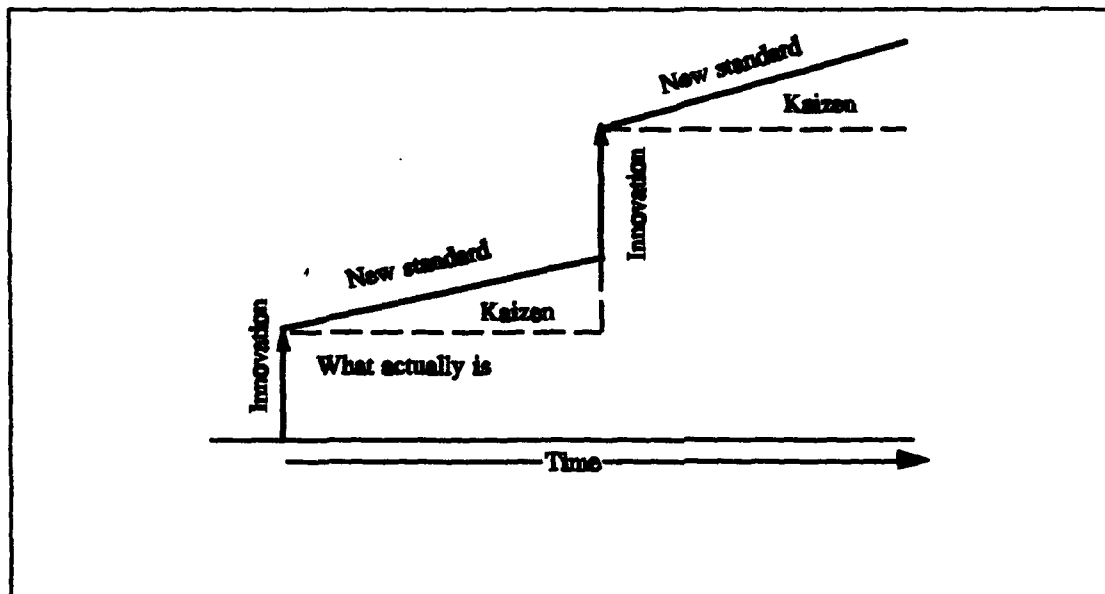
Figure 13. The Result of Innovation plus Kaizen (Imai, 1986:27)

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The Continuous Improvement of the U.S. DOD. The U.S. DOD recommends that their subordinate units create an environment in which continuous improvement is a way of life. One of the continuous improvement models they recommend is shown in the following figure (see Figure 14). The seven steps of this model are listed below.

1. Establish the TQM Management and Cultural Environment. Top management should commit to a vision to encourage the entire work force to improve the status quo. Superiors should eliminate the sources of fear to encourage their subordinates' innovative thinking and new ideas and to help them view problems as opportunities to improve their processes.

2. Define the Mission. The definition of each organization's mission should consider the following elements: each organization should identify its customers and their requirements, the processes capability, and the measurement of outputs. All members should understand their responsibilities, their customers, and their relationships to other customers (internal or external).

3. Set Performance Improvement Goal. The senior management should initiate the strategic goals which direct the middle and line management to set both functional and process-improvement goals. These goals should consider the organization's process capabilities to make them more
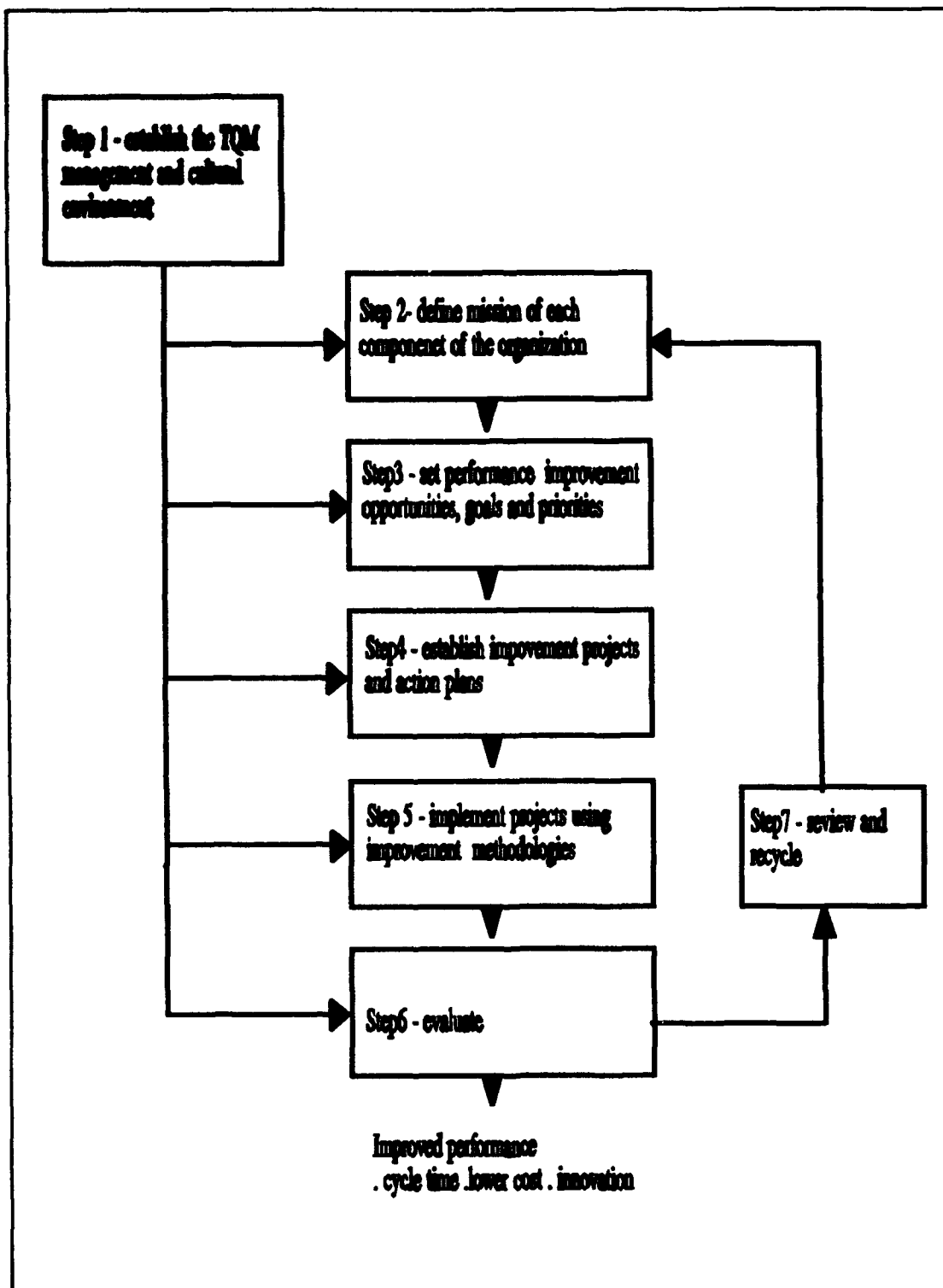
Figure 14. U.S. DOD Typical Performance Improvement Model
(Department of Defense, 1989:14)

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realistic.

      **4. Establish Improvement Project and Action
Plans**. The entire continuous improvement is directed by top
management, analyzed by middle management and performed by
the improvement teams. All levels should work consistently
toward the same goals.

      **5. Implement Projects Using Improvement Tools and
Methodologies**. The use of improvement tools and
methodologies could be applied to the basic performance
improvement cycle which includes:

. Define the process, fit the needs of the customer, and
identify suppliers.

. Develop and establish measures.

. Assess conformance to customer requirements.

. Analyze the improvement opportunities.

. Identify and rank the improvement opportunities.

. Improve process capability.

      6. Evaluate. A basic requirement to the
improvement efforts is the ability to evaluate the
performance of the improvement. In order to evaluate the
improvement performance, four measurements are suggested.
The process measurements track the process performance in
relation to internal customers (next operation) and external
customers (ultimate customer). The project measurements
evaluate the efforts of the performance improvement team.

The behavior change measurements show the tendency of TQM in an organization. The quality loss function measures the cost of quality from an engineering perspective.

   7. Review and Recycle. Because TQM is a way of life, the improvement efforts should break the beginning-growth-fading-out life cycle to a recycle. The purpose should be continuously reviewed to achieve a higher level of performance (Department of Defense, 1989:13-43).

   The Continuous Improvement Process (CIP) Model of Mansir and Schacht(Mansir and Schacht, 1989:5-8). Mansir and Schacht recommend a general model of continuous improvement process (CIP) which can be offered as a starting point for implementing TQM principles and practices. When applying this CIP model, each organization should define its own model from three general categories: organizational transformation, process improvement, and individual improvement.

   Organizational Transformation. Transformation is the process of organizational change. The organizational change includes the management structures, environmental factors, and related issues. The CIP transformation model is shown in the following figure (see Figure 15). The CIP model focuses on the continuous improvement culture change which provides a consistent vision to achieve the organizational goals and objectives. The entire

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organization should operate under this vision to establish a perpetual commitment to quality improvement.

Envisioning. Envisioning is a process which includes developing the vision, building awareness, creating the mission statement, and establishing the Executive Steering Committee (ESC) to oversee the mission.

Enabling. Enabling is a process which develops top management commitment, shapes the environment, provides resources, and empowers the organization to implement CIP principles and practices.

Focusing. Focusing is a process which establishes goals, implements goals and policy, and involves customers and suppliers to achieve the improvement.

Improving. Improving is a process which defines and standardizes processes, assesses process performance, improves processes, and measure progress to institutionalize advantages for the good of the organization.

Learning. Learning is a process which takes place throughout the four phases of the CIP model in which learning needs are identified, learning materials are obtained, learning methods are developed, and groups and individuals are trained and educated to apply the new knowledge to support the CIP effort.
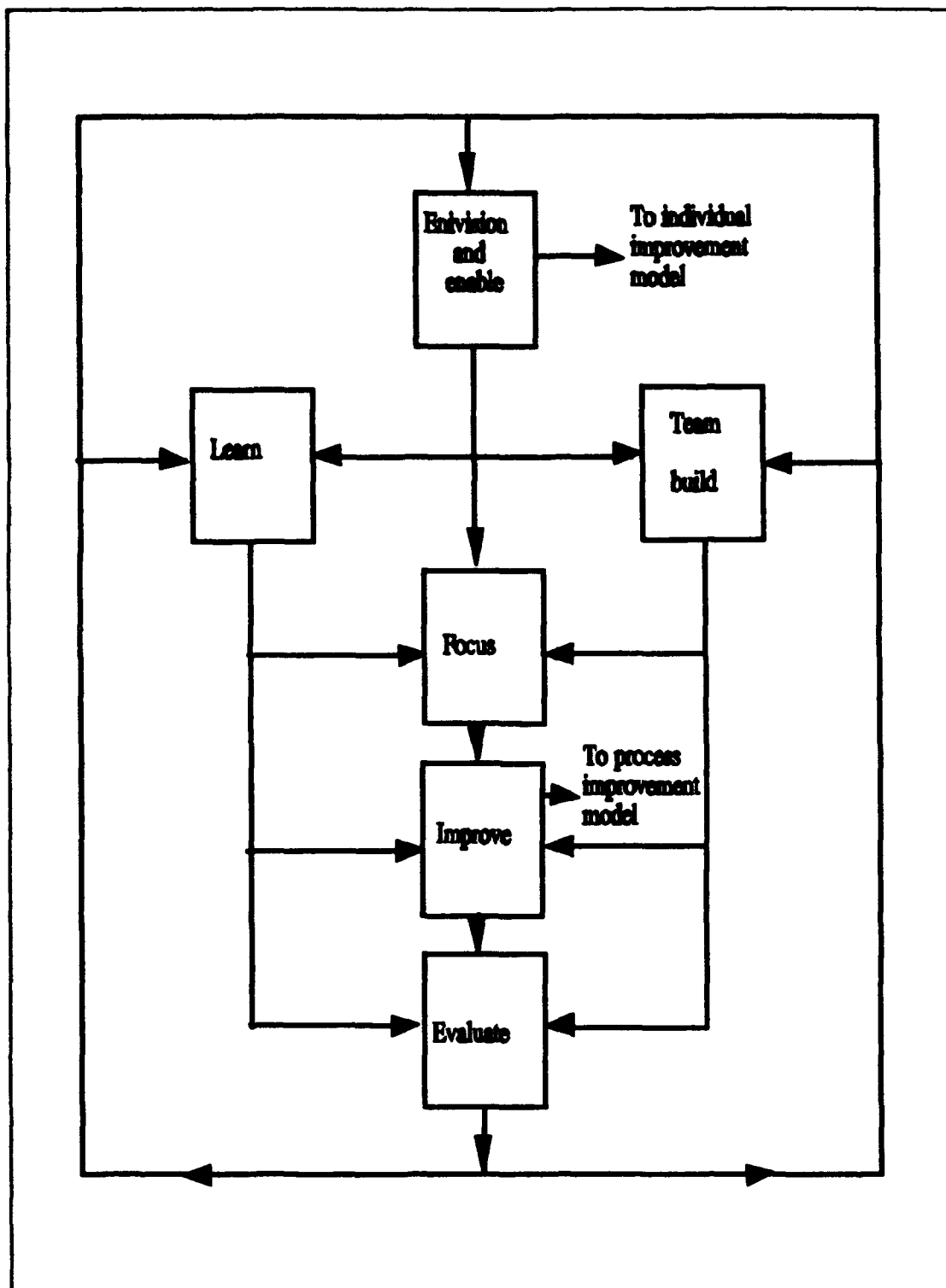
Figure 15. Transformation Model Framework (Mansir and Schacht, 1989:5-8)

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Team Building. Team building is another
process which takes place throughout the four phases of the
CIP model in which teams are formed in accordance with
goals, natural work groups are integrated, cross-functional
teams are formed, and process-improvement activities are
pursued to gain more power and momentum to support the CIP
effort.

Process Improvement. Process improvement is a way
to improve the standard of doing work. It includes the
definition of work flows, superior and subordinate
relationships, elimination of non-value-added effort,
reduction of variation, and control of processes. The CIP
process-improvement model shown in the following figure (see
Figure 16) is a seven-step process model. This model is
derived from the CIP transformation model.

1. Set the Stage for Process Improvement.
Top management must have a clear vision to lead the
organization to become aware of the need for improvement and
to commit to continuous improvement. The setting of the
stage includes basic education and training, goal setting,
barrier reduction, and leadership.

2. Select a Process to Improve. From the
current processes, identify one potential process which
presents the most serious problem and offers the greatest
opportunity for improvement. Once the process is selected,
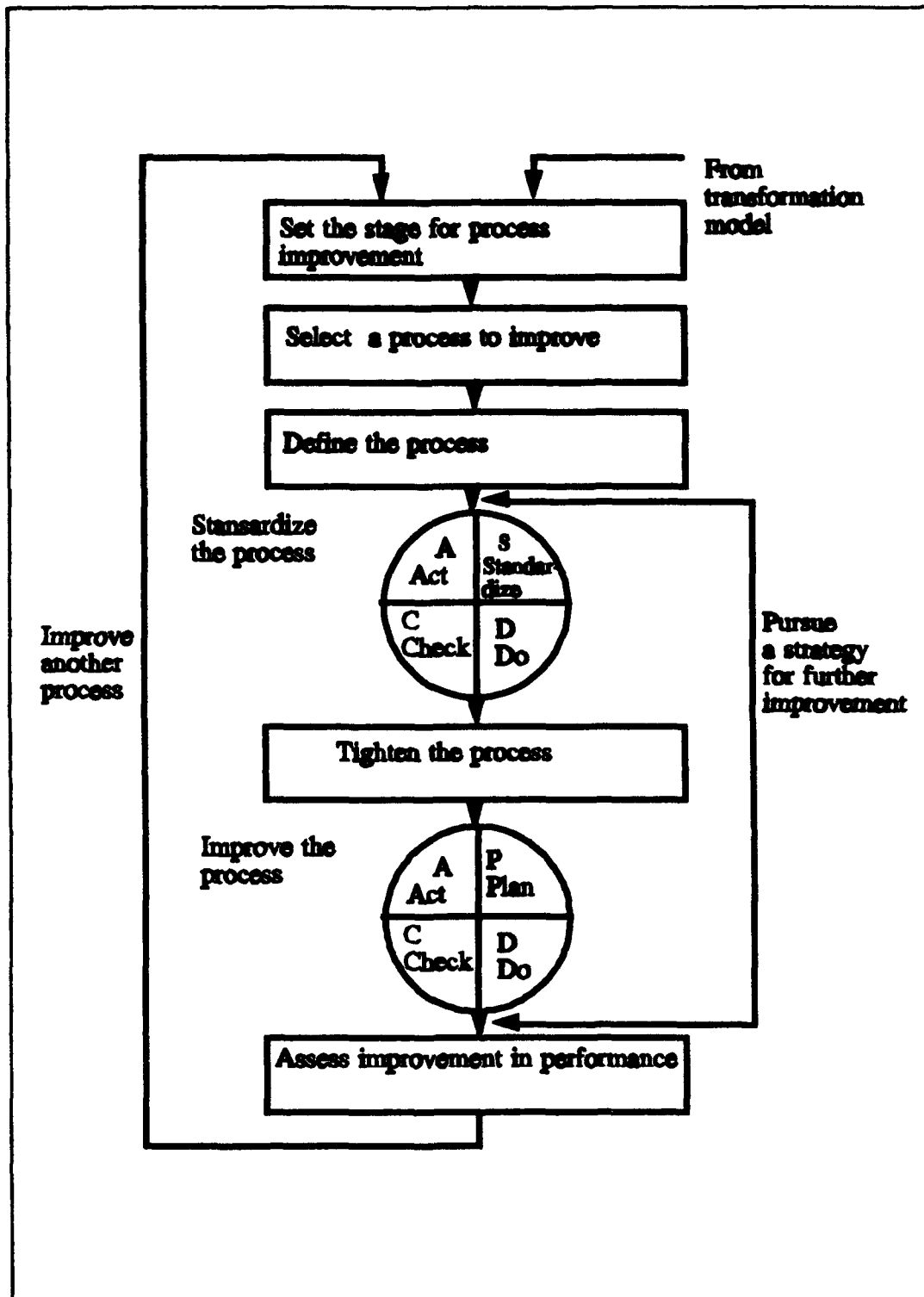
Figure 16. CIP Process-Improvement Model (Mansir and Schacht, 1989:5-13)

the root causes of its major problems and the performance measures should be identified. A plan is also created for the objectives of process improvement.

3. Define the Process. Process definition helps people realize who their customers and suppliers are. It also helps them develop process flow charts, and measures of process performance. Process definition lets people know where they are and where to go.

4. Standardize the Process. By standardizing the process, the current best way to perform that process can be decided. Standardization of a process is the basis for evaluating performance consistently and the basis for evaluating the success of the improvement efforts. Those efforts are accomplished by following the Standardize-Do-Check-Act (SDCA) cycle. Once the managers ensure the standard is in place, teams measure all process performance against that standard and reduce the performance variation.

5. Tighten the Process. Tightening is an effort to maintain the process-improvement efforts as effectively as possible. It ensures that the process meets its stated and perceived requirements. Tightening the process includes cleaning and straightening the process work areas, eliminating unnecessary equipment, instituting total productive maintenance, and establishing reliable, adequate data-collection systems.

6. __Improve the Process__. An improvement plan is designed and implemented by the application of the Plan-Do-Check-Act (PDCA) cycle. Data collection and measurement are used to support problem solving. Successful improvements are accomplished by well-trained teams and institutionalized systems.

7. __Assess Improvement Performance__. The improved performance and the successful improvement effort should be documented to benefit the others and bring recognition and celebration for the team's efforts. The documentation of the successful improved process provides a road map which allows others in the organization replicate the successful improvement techniques.

__Individual Improvement__. This model supposes any person may apply CIP-style structure and discipline to improve his/her daily activities. The individual activities are also interactive between superiors and subordinates. The CIP individual-improvement model follows the guidelines of the transformation model also includes seven-step processes.

1. __Envision Personal Improvement__. A person should be aware the needs to improve and the ability to improve. A person also should be aware of his position in relation to the organization and his/her customers and suppliers. From those assessments, a person's vision and

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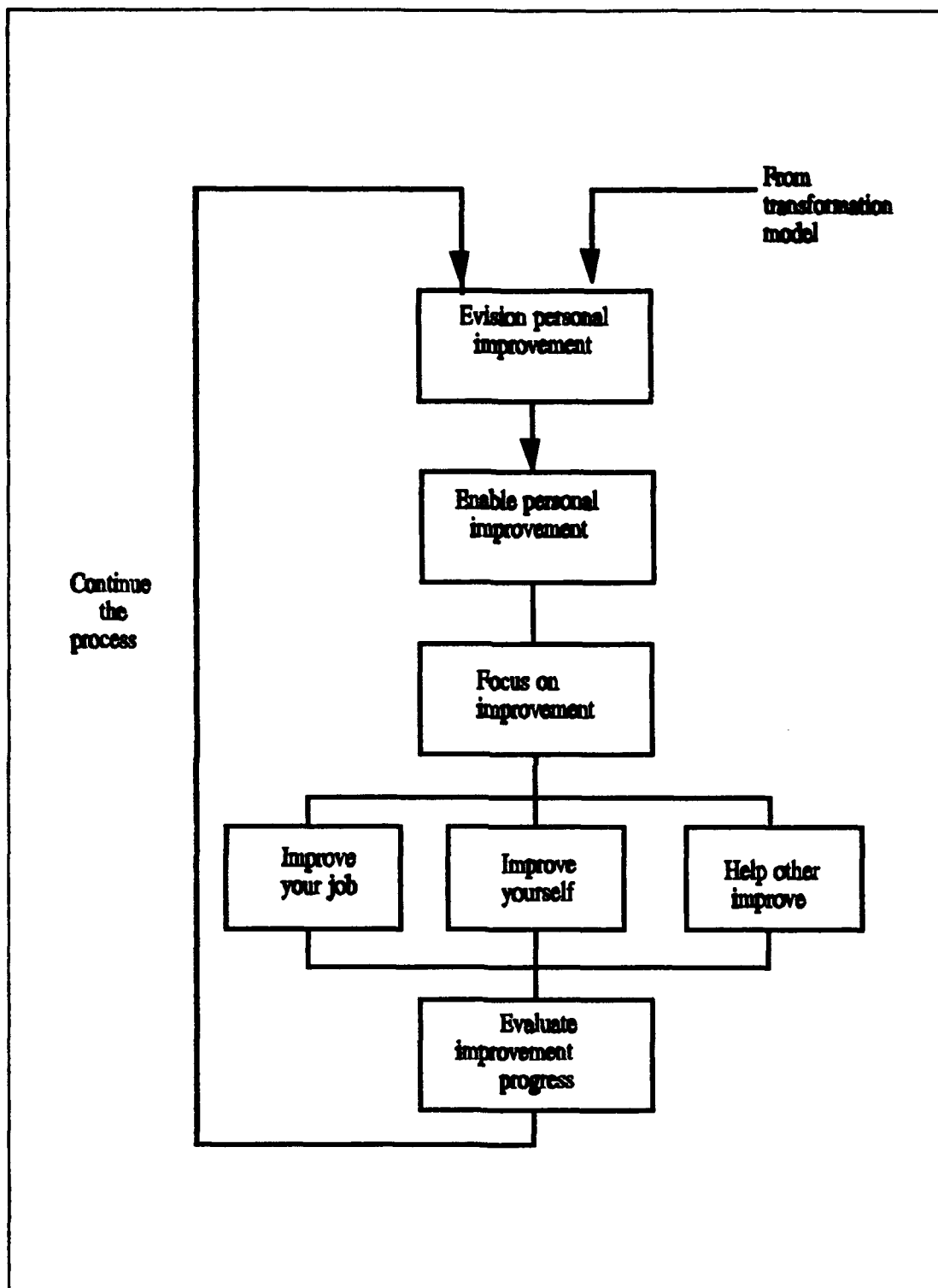
Figure 17. CIP Individual-Improvement Model (Mansir and Schacht, 1989:5-20)

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expectation could be created.

3. Focus on Improvement. A person should
align personal goals with organizational goals and develop a
cohesive improvement strategy to guide his/her efforts. Set
a high priority and create time to demonstrate the decision
to improvement.

4. Improve Your Job. You may deal with your
jobs as a collection of the processes and establish control
over them by defining them and understanding their relations
with one another. Continuous improvement could be done by
small, incremental improvements over time.

5. Improve yourself. Develop your own
vision and demonstrate your leadership through commitment to
personal improvement. You should also maintain and improve
your relationships with others through communication and
education to remove barriers.

6. Help Others Improve. Through your
individual effort to help, others also can become leaders
themselves. Live out your model and express your successful
example to your peers and share the individual-improvement
experience.

7. Evaluate Improvement Progress. Because
you already have a vision, values, and measures for your
process, you should document your improvement against them.

You must know how successful you are in your improving otherwise you will not know how to celebrate your success.

The detailed CIP activities of Mansir and Schacht's model are listed in Appendix C.

TQM in Bureaucratic Organizations

When exploring ways of applying Total Quality Management (TQM) in a bureaucratic organization, there are some characteristic aspects to be considered. Comparing the tendencies between a bureaucratic organization and TQM, what the bureaucratic organization lacks is the richness of TQM. Any manager who tries to improve product quality by decreasing the organization's bureaucratic tendencies can practice TQM to great advantage.

Table 3.
The Characteristics Between
Bureaucratic Organization and TQM.

The tendencies of a bureaucratic organization are:	The tendencies of TQM are:
1. The tendency toward red tape. 2. The tendency toward inflexibility. 3. The tendency toward restricting or narrowing individuals through specialization. 4. The tendency toward insularity and stratification. 5. The tendency toward impersonalization. 6. The tendency toward downward communications.	1. Eliminating slogans, exhortations and targets for the workforce. 2. Always adopt the new philosophy. 3. Cross-functional problem solving. 4. Empowering workers. 5. Drive out of fear. 6. Break down barriers between staff.

(Richard and Victor 1973:10; Deming, 1989:24-96)

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IV. The Experience of the Successful
Quality Improvement Organizations

The successful experience of quality improvement organizations can be good examples for ROCAF to learn. Those valuable experience can help ROCAF save time and avoid unnecessary problems.

The Implementation of TQM in the U.S. Department of Defense

After the 1986 Presidential Executive Order 12252 the Secretary of Defense, Frank Carlucci, issued the Department of Defense posture on quality letter on 30 March 1988 (Carlucci, 1988). He addressed that higher performance could be reached through high quality. In order to meet the president's productivity goal, the Total Quality Management efforts were initiated in which the ultimate goal is the satisfied, quality-equipped, quality-supported soldier, sailor, airman, and marine. In 1990, four DOD organizations received the President's Council on Management Improvement Awards. In 1991, the only two winners of Quality Improvement Prototype Awards and the seven of the ten finalists were from DOD (Wise, 1991:13)

DOD had chosen not to design TQM by direction. Instead, DOD has provided the vision and the intent through broad, centralized concepts and let each organization design

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their implementation plan to fit their own mission and culture (Wise, 1991:3). Because of the importance of top management commitment, forty-five of the top leaders from the Office of the Secretary of Defense, the military services, the Joint Chiefs of Staff, and defense agencies met together to discuses the concepts and implementation plan of Total Quality Management. The external expert, William W. Scherkenbach from General Motors Corporation, was invited to brief. After this meeting, the Department of Defense launched the implementation of Total Quality Management (TQM). The features of TQM include: the prevention of defects, focusing on the processes, continuous improvement, innovation of new processes and products, and the application to all types of work. (Springs, 1988:33-35).

The Total Quality Management Master Plan was developed in August 1988. The TQM Master Plan has three ranges, the long-range, the mid-range, and the short-range. The long-range goals include establish TQM as a way of life, doing continuous process improvement, entire defense industry involvement, and the congressional support for TQM. The mid-range goals include implementing policy deployment mechanisms, coordinating DOD directives/regulations/ instructions and TQM, eliminating barriers to TQM implementation, top management commitment to implementation,

the application of TQM in dealing with industry, promoting a standard set of TQM training materials, placing TQM facilitation staff at all working level, understanding and coordinating with other TQM efforts in Federal Government, and gaining the support from key legislative leaders. The short-range goals include: establishing executive committee and subordinate teams, facilitating and training staff facilitator, implementing the TQM training strategy and developing training materials, establishing R & D programs, developing and implementing recognition and reward systems, ensuring consistency among TQM and major documentation and guidance, and enlisting defense industry commitment (Department of Defense, 1988).

The Defense Council on Integrity and Management Improvement (DCIMI) is the DOD Executive Steering Committee for TQM. The Defense Systems Management College (DSMC) was designated to design and implement TQM training. The training strategy has two objectives. The first is to arouse the TQM awareness for managers with an overview of TQM principles and concepts. The second is to provide guidelines and resources to managers who responsible for follow-on training of their subordinates. DSMC has developed two types of courses, a one day Senior Management Seminar course and a six day General Management Awareness course. The one day course includes defining the key

concepts of TQM and their transition into DOD activities, team building and related skills (Department of Defense, 1989).

Two external consulting organizations and DMSC were contracted to develop training program. The training program includes two methods. One method is using outside experts to assist organization to develop training program. The other method is the internal training approach which applies the Instructional Systems Development (ISD) as a systematic process training programs. With ISD approach, organization can train their own people to be instructors. The current DOD organizations which can offer TQM courses like the Army War College, the Naval Post Graduate School, Air War College, and the Air Force Institute of Technology (Springs, 1989:43-45)

The Implementation of TQM in the Department of the U.S. Air Force

The initial TQM step of the U.S. Air Force was started by the Chief of Staff of the Air Force and the Secretary of the Air Force who sent a joint letter on 26 May 1988. It stated that they fully support the memorandum and posture of quality announced by the Secretary of Defense. In October 1988, U.S. Air Force sent officers to Japan to learn how Japanese manage and apply the modern engineering and

production technologies. On this trip they found Japanese applied variability reduction technologies and process-oriented approaches to team building and continuous improvement which was supported directly by senior management.

The Vice Chief of Staff also required the acquisition commands validate user requirements by developing new systems or modifying the existing systems and reducing performance variation until reaching the most cost-effective level. Four objectives were stated to achieve those requirements:

1) Enforce awareness and commitment.

2) Incorporate TQM in the Acquisition Process.

3) Assess the effectiveness of TQM.

4) Eliminate barriers to TQM implementation.

In January 1988, after the arrival of General Alfred G. Hansen, the Assistant to the Commander for Quality Programs was established in the Air Force Logistics Command. In February 1988, quality programs offices had been built at all of the ALCs. The success of the AFLC quality activities could derive from QP4 program which stands for People + Process + Product + Performance. AFLC had developed a Strategic Implementation Plan (SIP) 88-3-1 which identified senior management as responsible for creating a positive environment for AFLC people and recognized the middle

management as responsible for translating policies and directions into meaningful actions. One success example is that the Acquisition Logistics Division applied the AFIT's Quality Working Group's Roadmap to Total Quality Management (reference Appendix B) as a guide to develop its TQM implementing strategy. In its letter SIP 88-3-2 and SIP 88-3-3 also talked about the training to deal with emerging logistics challenges and justifying and defending manpower requirements and funding levels.

The AFLC's Quality Bill of Rights is a significant top commitment to employees' quality rights. The employees, rights including:

1. The right to question the way their business was managed or operated as usual.

2. The right to express themselves without fear.

3. The right to expect top management commitment to quality.

4. The right to halt production until defects were corrected.

5. The right to be proud of the products and service of the AFLC.

Quality Circles and Process Action Teams were used to strengthen AFLC employees' production methods (Springs, 1989:47-58).

The Implementation of TQM in the U.S. Department of the Navy (DON)

In June 1987, earlier than the commitment of the Department of Defense, the Secretary of the Navy, Chief of Naval Operations, and Commandant of the Marine Corps signed the DON Productivity Improvement Guiding Principles to commit to productivity improvement. From 1984 to 1986, the Secretary of the Navy introduced the management and control techniques of private industry. Since September 1986, the DON conducted productivity workshops to prepare for the DON Total Improvement Action Plan (Springs, 1989:71).

The TQM Implementation Plan of the TQM builds on seven propositions:

1. Adopt principles of the DOD Posture on Quality Support with a top level commitment.

2. Empower the subordinate commands within the DON with the autonomy to implement TQM.

3. Establish a steering group and commit to continuous improvement process.

4. Strengthen the teamwork between Quality Management Boards (QMBs) and Process Action Teams (PATs).

5. Training started with top management.

6. Encourage industry to employ TQM through contractual arrangements.

7. Provide resources and encouragement to succeed and reward success; understand teamwork and leadership to ensure the consistent quality.

The DON did not have a special organization for implementation of TQM. The subordinate commands were given the authority to establish their own structure depending on their needs. The DON Executive Level Steering Group is the top of this structure. The members of this group include the Under Secretaries of the Navy; all Assistant Secretaries of the Navy; the Vice Chief of Naval Operations; the Assistant Commandant of the Marine Corps; the Deputy Chief of Naval Operations (Logistics); and selected second echelon commanders (Springs, 1989:78).

In 1989, the Fleet Support and Field Activity Branch (NAVIR-04) of Naval Air System Command began TQM implementation. The TQM structure of NAVAIR-04 was Executive Steering Committee (ESC), Quality Management Board (QMB) and the Process Action Team (PATS) (Wise, 1992:15).

The Implementation of TQM in the U.S. Department of the Army

In 1985, the Army began using quality management tools to monitor contracts. In 1988, the senior level committee was established which includes the Secretary and Under Secretary of the Army and several general officers. In

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November 1988, the Army Implementation Plan for Total

Quality Management was published.

The army TQM is directed by Army Total Quality

Management (ATQMC) which reports directly to the Defense

Council on Integrity and Management Improvement. The

membership of Executive Steering Committees (ESCs) includes

the Major Command (MACOM) and the Major Subordinate Command

(MSC) and chaired by the commander.

Eight tasks of implementation, established in 1988, are

listed below:

TASK

1. Infrastructure

   a. Identify Army Focal Point for TQM

   b. Establish working group to support Army Total Quality
      Management

   c. First meeting of ATQMC for TQM

   d. Establish Major Command Executive Steering Groups
(ESC)

   e. Establish functional work groups to support a major
Command ESCs

   f. Establish major subordinate command (MSC) Executive
Steering Groups

   g. Establish Functional Work groups to support major
subordinate command ESCs

h. Develop Major Command TQM implementation Plans

i. Develop Major Subordinate Command TQM Implementation

Plans

2. Training

a. Host first executive one day TQM session.

b. Conduct Army Total Quality management (ATQMC) and Major

Command (MACOM) commander and army staff principal TQM

training.

c. Identify and retain consultant(s) for TQM training.

d. Identify four day TQM session for ATQMC functional work

group members.

e. Publish Army training plan.

f. 100% ESC members receive one day executive training.

g. 100% working group members receive four day management

training.

h. Establish in house training programs at appropriate

institutions.

3. Evaluation

a. Develop measures to relate progress of TQM

implementation and success.

b. Develop guidelines for annual command report which

reflects TQM measures.

c. Conduct first year end review of TQM implementation

progress.

d. Update TQM Implementation Plan.

4. Involve and Influence Industry

a. SARDA (Assistant Secretary of the Army; Research, Development and Acquisition), MACOM and MSC ESCs provide briefings to contractor executives and industrial associations on TQM plans.

b. Establish Joint Army-Industry teams to identify and eliminate roadblocks to successful TQM implementation.

c. Expand the Contractor Performance Certification Program adoption of TQM.

d. Develop and implement the Army Exemplary Contractor Program to provide publicity and recognition to contractors who achieve High TQM payoff on army Contracts.

e. Conduct Joint Government/Industry Seminars for exchange and feedback on TQM practices, tools, and techniques that are providing substantial payoffs.

5. Government Support to Industry

a. Publish procedures and practices which measure and reward successful with DoD implementation of TQM in the contract award process.

b. Develop incentive techniques for inclusion in contracts to reward cost reductions achieved through TQM application.

c. Develop and fund manufacturing technology thrusts for application of advanced technologies to processes which have inherently been inefficient.

d. Develop and implement program for sharing contractor investments for productivity improvement as a financial motivation for near term application of state-of-the-art technology of process improvement.

6. Policy

a. Publish an Army Posture Statement on Total Quality Management.

b. Develop action plan for elimination of roadblocks to TQM

c. Identify the Army Regulations and Pamphlet which require modification due to TQM and schedule their revision.

d. Update Templates (Transition from Development to Production, 4245. 7-m) to include TQM.

7. Awareness and Motivation

a. Brief industrial associations.

b. Visit contractor organizations to publicize army TQM interest and keep up to date on contractor implementation progress.

c. Develop and implement a program for group sharing and for command reporting of savings resulting from TQM implementation.

d. Develop and implement a recognition system to honor team achievement at each command.

8. Initiatives

a. Define the objectives, common and unique components, divergent or conflicting elements.

b. Synchronize and eliminate conflicting elements of initiatives. (Springs, 1989:86-91)

V. The Characteristics of the Republic of China Air Force
and TQM Culture Change

Two primary missions are performed by the ROCAF: the air defense of territory controlled by the Republic of China (ROC) and the tactical support of the ROC Army and Navy. These missions are accomplished by maintenance of air superiority over the Taiwan Straits, air cover and escort for naval and army convoys, air-to-sea missions which include antiship and antisubmarine operations, and repelling of invasions from Communist China (Government Information Office, 1988:171). Most of these mission are similar to the missions of other air forces, the only exception being the repelling of invasions from Communist China.

The reason the government of the ROC still exists on Taiwan is that the ROC prefers the protection and maintenance of traditional Chinese culture while Communist China (the People's Republic of China) was purposely destroying traditional Chinese culture. In recent years, however, the Chinese Communists have began to realize that thousands of years culture are assets which help to maintain the stability of Chinese society and that such long-held beliefs are not easy to destroy or transform through communism. In the short run, the harm to virtues and habits in mainland China is immense. But in the long run, as long as the belief in Chinese culture exists in the Chinese mind,

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the flow of history will bring the Chinese people to a new position where people can choose their way of life.

Because of the immense numerical superiority enjoyed by communist China's military, the ROCAF has no choice but to depend on superior quality of its personnel and weapons systems to maintain its security. The reason the ROCAF can still effectively control the airspace over Taiwan is that all of its people share the same cultural beliefs and values which motivate them to resist the military invasion from Communist China even though the rest of the world thinks it is impossible. After half a century, history tells us communism is inevitably going to disappear. The current economic and lifestyle changes in mainland China make us believe the essence of Chinese culture still exists as long as political policy is not too far away from the truth.

Because the successful implementation of TQM relies on the human resource, this analysis of ROCAF characteristics focuses on human factors analysis. In analyzing the characteristics of the ROCAF with TQM, some primary Chinese thoughts needed to be understood. The ROCAF should maximize these good attributes and minimize those bad attributes. In Chinese history, Confucianism has endured as the basic social and political value system for over 2,000 years. Confucianism has been the official education material for many dynasties, and the ROC government also continued this

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tradition since its establishment. Confucianism was developed through the formal curricula of the education system and through the promotion of government propaganda. Confucianism is a philosophy of human nature; the elements listed below are most significant: jen (benevolence), yi (righteousness), and li (principle) (Samovar and Poter, 1991:68).

The Impact of Jen

Jen (benevolence) is one of the most important concepts in Chinese thought. The other meanings of jen include love, altruism, kindness, charity, compassion, magnanimity, perfect virtue, goodness, true manhood, manhood at its best, human-heartedness, humaneness humanity (Chan, 1969:1). Confucius said, "Do not do to others what you do not want others to do to you," "There is a way to win their (the people's) hearts. It is to give them and keep for them what is liked and not to do to them what is not liked," "A man of jen is respectful in private life, serious in handling affairs, and loyal in his association with people," and "A person with honeyed words and pious gestures is seldom a man of jen" (Ebrey, 1993:19).

Considering the general virtue, jen is no longer a special moral characteristic of leaders but a quality standard recognized by all Chinese. According to the Analects of Confucius, "The man of jen, wishing to establish

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his own character, also seeks to establish the character of others. Wishing to succeed, he also seeks to help others succeed. To be able to judge of others by what is near in ourselves, this may be the method of achieving jen" (Chan, 1969:6) This quotation demonstrates that Confucianism encourages people to help each other.

When TQM is practiced in Chinese society, top management behavior and commitment will be judged by the viewpoints and standards mentioned above. The Chinese think a great leader should possess these characteristics not only in public life but also in private life to show subordinates the right way to do business. The symbolic meaning of a quality leader is more important than the functions of a quality leader. So, behaving a quality way is more necessary before conducting a quality improvement. In the practice of TQM, the acceptance from subordinates will depend on the top management's involvement which is accomplished through jen. The Chinese leader is always called "big father," especially in a military organization. Most of the time, the leader of an organization is expected to behave like a father to show jen (benevolence) to his subordinates. If the relationship between superior and subordinates is maintained like father and son, the loyalty and strength of an organization will be no doubt be stronger than ever.

The Impact of Yi (Righteousness)

The meanings of yi include faithfulness, loyalty, righteousness, or justice. It is a way to do business among social relationships. A person with yi will not pursue individual interest and profit at the expense of others. Through yi we can look beyond personal, immediate profit and transfer ourselves to the original goodness of human nature that communicates us to other people (Samovar and Porter, 1991:69).

Confucius says, "If not in accordance with yi I become rich and elevated, I regard (these gains) as floating clouds." Under the standards of yi the virtuous life restrains people in regard to material goods and the desire for pleasure and comfort because these pursuits are not intrinsically worthwhile actions. Yi is the basis of all virtues; if a virtue lacks the element of yi, the performance of virtue will be out of the track. Thus Confucius says, "If a leader has courage but no yi, he will make trouble; if a small person has courage but no yi, he will become a bandit" (Cheng, 1992:235).

In Chun Yung (The Doctrine of the Mean), Confucius mentions yi as appropriateness or fitness. Too much or too little is not the way we do business; only the appropriate is what people should do. In Confucius's mind he has no preference, nor prohibitions; he only compares to yi. That

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is why he can do the right thing at the right time. Thus, when a Duke asked Confucius about governing, the Master said, "lead them by means of government policy and regulate them through punishments, and the people will be evasive and have no sense of shame. Lead them by means of virtue and regulate them through rituals and they will have a sense of shame and moreover have standards" (Ebrey, 1993:21). In the view of Mencius (one philosopher of Confucianism), yi as a type of feeling and sentiment which motivates people toward actions preserves dignity and consistency. Mencius mentioned that "The feeling of sympathy is the beginning of jen (benevolence); the feeling of shame is the beginning of yi (righteousness); the feeling of modesty is the beginning of li (propriety); and the feeling of right and wrong is the beginning of Chih (wisdom)" (Cheng, 1991:237). The sentiment of shame or the feeling of not being able to do certain things is the beginning of yi which must be cultivated firmly and consistently. Mencius said, "I know words, I can skilled at cultivating my vast chi (a subtle matter pervading the body, on which the body's well-being depends), dare to ask, what is the vast chi? It is hard to say. As chi, it is very great and very powerful. It needs to be nourished with straightforwardness and no harm should be done to it. Then it will fill between heaven and earth. As chi it matches with yi and the Way (tao, correct method

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to do business), and if one does not have this (yi), the man of chi will not be strong. The vast chi is born of collection of yi; it is what is gotten and taken by yi" (Richards, 1964:72). The action of yi can bring about the quality of fitness in a situation. The ultimate end of yi in life is achieving a state of perfection where the objective has assumed subjective significance and the subjective assumed objective (and therefore universal) validity (Cheng, 1991:238).

In the application of yi to TQM, top management should establish a system to encourage subordinates to align their interests with the organization's goal. After the individual's physical needs are satisfied, top management should guide employees to an awareness of their inability and shame for their inferior performance. Only those who know their shame can behave bravely. Only those who dare to face their faults have more opportunities to approach the correct way to do business. Top management should create an atmosphere to teach employees to pursue intrinsic success and but not extrinsic factors only. Top management should decrease the negative competition in the organization and increase the cooperation in the organization. The entire workforce should do the right things right the first time. Product design should be considered for the fitness for use. Quality improvement actions should be consistently pursued

and recognized as a responsibility of each employee in their daily work. Top management should apply their jen to guide employees toward yi which makes employees aware that to do things right is not only a duty but an honor.

The Impact of Li (Principle)

In the last 800 years Confucianism has evolved to Neo-Confucianism. Neo-Confucianism, the Philosophy of Principle (Li-hsueh), has divided into two branches: the rationalistic Neo-Confucianism of Chu Hsi(1130-1200) and the idealistic Neo-Confucianism of Wang Yang-ming (1472-1529). The meanings of li include principle, pattern and order, the principle of nature, principle by which things are, ultimate principle, and the ultimate of nonbeing (Chan, 1969:45-53).

Li (principle) is a methodology bridging the knowing mind and the object of knowledge to find the truth of the world. Chu Hsi interpreted mind as the spirit of illumination which endowed li infinitely and responds to affairs instantaneously. He said, "the mind of man is nothing but a totality of li." If one does not understand li he will not realize the truth. Chu Hsi recommends two things in his methodology for learning. He said:

> The efforts of a student consist only of "residing in serious-mindedness" (chu-ching) and "exhausting principle" (chiung-li). These two things are mutually reinforcing each other. When exhausting principle, the efforts of chu-ching become daily progressive, and when residing in serious-mindedness, the efforts of chiung-li become daily improved." (Cheng, 1991:381)

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"Residing in serious-mindedness" enables people with a clear mind to solve problems while "exhausting principles" nourishes the mind to analyze the problem more clearly. The reason for residing in serious-mindedness is to strengthen self-control and to move toward one-mindedness. When the mind reaches a state of one-mindedness (Ching), a person will achieve "centrality" (chun) and harmony (ho) with the outside environment. Ching (one-mindedness) can transform the mind into a form which has the potential and ability to respond to things in proper measure. Mencius said, "The way of learning is nearly to seek the wandering (lost) mind." This indicates the function of ching (one-mindedness) in learning. Ching can strengthen the self-minding and self-concentration. If learning without ching (one-mindedness), there is no focus and direction to learning (Chen, 1991:385-386). The reason for applying exhausting principles is to find a way to do things. From the following view of Chu Hsi, we can understand that learning activities not only include mental activities but also conduct practice.

> In learning, one should not become far-reaching and high-sounding. One need only pay attention to one's words and conduct (practice) so that one will be substantial. Nowadays scholars talk of truth (tao); only talks of principles (li), but do not talk of the thing (shih); only talk of mind, but do not talk of body. The talk is profound, but there is no evidence for its truth. It elapses into emptiness and heterodoxy. (Cheng, 1991:433)

The philosophy of Wang Yang-ming is a philosophy of mind. He mentioned that "mind is principle (li)," and the substance of mind is liang-chih (knowledge of goodness) which is the feeling of right and wrong without thinking and learning. Lian-chih has the ability to judge good and bad. One example he gave to his student is that:

> In wintertime, one naturally thinks about the coldness of the parents, and thus will seek to understand the principles of how to make them warm. In summertime, one will naturally think about the hotness of the parents, and thus will seek to understand the principles of how to make them cool. These are the consequences derived from (or issuing from) the mind of sincerity and filial piety. Only when there is such a mind of sincerity and filial piety, will there be such consequences. (Cheng, 1991:405)

He does not deny the searching for knowledge, but any such search must be rooted in a desire or will to bring about a certain value to such actions. To practice the mind of goodness in daily life he suggests the unity of knowledge and action. Under the unity of knowledge and action, the mind can respond to different situations with different evaluations of good and desires for different forms of action. The end of Wang's philosophy is that everyone should endeavor to become a sage, whose ultimate state of mind is to reach chung-ho (equilibrium-harmony). Chung-ho is a state in which all things will find their proper places in a comprehensive harmony. The goal of education is to reach harmony and achieve the well-being of all people (Cheng, 1991:442).

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When applying the li (principle) philosophy to TQM, top management should believe in the potential of the employee and initiate and develop the "mind of goodness" of the employee to pursue the truth of the job. All workers should do their job with ching (one-mindedness) and treat work as a career but not at the expense of money. When workers face and solve production problems, the "residing in serious-mindedness" can help the solver clear the mind and overcome the obstacles of problems more easily. Most of the time, in a production organization, problems are complicated and involve many sections. At such moments, the mind of goodness encourages people to be more willing to consider and cooperate with others. At such times, the "mind is principle" makes employees confident that their talents give them the ability to take the initial step to deal with problems. At such times, the mind of goodness makes people believe that their willingness to contribute will create more organizational value than their individual efforts. Through the exhausting principle the causes of problems could be analyzed by TQM tools. Through the exhausting principle the problems could be solved by continuous improvement. Through the unity of mind of goodness and the exhausting principle the customer needs could be satisfied.

The Possible Barriers to TQM in the ROCAF

In traditional Chinese value system, the society is higher than the individual, the obligation is in front of the privilege, the self-restraint is more important than the freedom, and the ethical appealing is more than the discipline of law. This vale system is compatible to TQM system, however the ROCAF organization is a totally military organization, one kind of bureaucratic organization. The characteristics of bureaucratic organization which were presented in Chapter II and have happened in most military organizations are in conflict with TQM characteristics. When implementing TQM in the ROCAF, the impact of these bureaucratic tendencies must be minimized.

The Impact of Rank

The Chinese people have strong a sense of filial piety toward their parents. Chinese families focus on their parents, and children should obey their parents. Like Confucius said, "Parents are always right" and "Filial piety is the most important of all virtues." The family plays an important role in extending Chinese values. In a Chinese family a person's role is determined by gender, age, and particular position in a family. Among the Chinese, there are three basic human relationships which relate to the family: the relationship between father and son, between husband and wife, and between the elder brother and the

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younger brother. This indicates that people should treat each other according to the gender, age or generation. All families should obey their parents, because of his older generation, age and dignity.

In a Chinese family, while living with their parents, the attitudes of family members lean more toward strictness of discipline and proper behavior, and less toward to the expression of opinions or independence (Ho, 1987:9). In a Chinese organization the relationship between superiors and subordinates is affected more or less by the traditional Chinese parents-children relationship. There is a positive correlation between filial piety and obedience in Chinese society. Chinese quite readily show their respect to what they consider an authority. When the situation is not clear the Chinese is more willing to behave as a subordinate and to treat the other as an authority (Yang, 1987:107-170).

When applying TQM in the ROCAF, top management should encourage people to deal with quality problems through quality control systems and avoid problem solved by authority. Top management can show his attitude to TQM but not influence subordinates by position power. The superiors should have the courage to confess he does not know and accept the truth with an open mind. The employees should fulfill their responsibilities to perform their duty and offer suggestions to correct problems. The leader has the

responsibility to lead the entire organization to cultivate a democratic and scientific climate to do business. The leader should supply sufficient information for subordinates to complete their duties. The leader should let more qualified subordinates share in the decision making and create a reasonable methodology by discussion but not by personal intuition.

The Impact of Management Resistance to Change. The characteristic elements of this barrier include the management unwilling to commit to the long run good of the government; the managers are too confident to see the need to change; employees do not see that the interval organizational environment needs to change eit er; the communications within the organization are deficient; management is unwilling to give up control and lacks constancy of purpose. An organization may need 10 to 15 years to conmpletely transform its thinking (Deming, 1989:149-155). The following elements are a reference guidance for leading a TQM effort:

. Understand the "mysterious" aspects of TQM and be able to explain them (profound knowledge).

. Provide a positive environment for value added efforts.

. Cultivate a culture of cooperation vice competition.

. Live out TQM by personal example.

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. Foster holistic and creative approaches to improving processes.

. Provide examples and evidence that TQM is working.

. Become a stakeholder with the workforce for the success of the organization.

. Facilitate TQM. Become a coach.

. Apply TQM principles (apply head knowledge).

. Lose your "business as usual" approach to improvement.

. Publish long run organizational goals that commit resources (link TQM to the organization's business plan).

. Measure improvement.

. Make your commitment to TQM visible to the workforce.

. Develop a critical mass of TQM proponents.

. Incentivize people to apply TQM.

. Link promotions and rewards to TQM vice short term goals.

. Make organizational changes when there are barriers to TQM.

. Ensure all directives clearly come under the TQM umbrella.

. Build internal and external political consensus for TQM approaches.

. Build trust with the workforce by commitment to provide jobs.

. Be patient.

. Influence peers and superiors alike (Brown, 1990:56).

<u>The Impact of Competition in Contracting Regulations</u>.
The contracting regulations which encourage competition
among military material suppliers lead to the resource
wasted and adversarial relationships with suppliers. Under
these regulations it is not easy to sustain a long term
relationship with a quality supplier because the low bid
price. The following elements may be a potential solution
to overcoming the contracting regulations barrier:

. Amend contracting regulations to allow for purchase of
quality but not price; and maintain a long term relationship
with suppliers.

. Award on total minimum cost to the system.

. Avoid the unnecessary contracting regulations
restriction.

. Make the buyer-supplier relationship a cooperative longer
term relationship.

. Decrease the amount of competition within the service
(Brown, 1990:65).

<u>The Impact of Legislature Oversight</u>. The vote
incentive is more interesting than the TQM improvement
incentive for politicians. The acquisition procedures show
a concern with the interest of each candidate's hometown
defense industry. No defense industry company is willing to
be out of the contract bid system. Defense industry
procurement represents a big stake for any candidate. The

Legislature has great influences on the Acquisition System. For TQM, top management commitment to quality philosophy is very critical. The question is "who is the top management of DOD acquisition system ?" The Secretary of Defense my be the figurehead of the DOD, but the Legislature is really one who controls the budget and influences the acquisition regulations. In contrast with the private a company, the secretary of Defense is a manager invited by the stockholder board, the Legislature. The following elements are potential solutions to the barrier:

. The DOD should work with Legislature for continuous improvement.

. DOD should be more frank with Legislature concerning "bad news."

. DOD and defense contractors must perform more ethically to build Legislature's trust.

. Educate the Legislature and the public to accept the TQM change in the acquisition system.

The Impact of Management Mobility. The time period a manager stays in a position influences his decision making. Employees would not be willing to believe the promises of a leader who was going to leave in a short times. When manager's service on is assigned for a short term he usually seeks quick results to please his superiors for his own interest instead of long term consideration. Management

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mobility stops the consistency of purpose and halts the teamwork within an organization. Because the lack of consistency of purpose it also prevents the forward thinking for solving problems. When previous management was perceived as success, the implementation of a successor's creative suggestions may be discouraged. To overcome this barrier, the solution guides are listed below:

. New managers or leaders should receive TQM training before they move into new positions.

. The consistency of purpose within an organization should be institutionalized a new leader can recommend a better plan which has discussed by entire work force (Brown, 1990:85).

VI. Plan for Implementation of Total Quality Management
in The Republic of China Air Force

There are many elements which could affect the success
of TQM in the ROCAF. One of the primary elements is
cultural change (as discussed in Chapter V). The other four
elements include top management, TQM structure
establishment, TQM education and training and continuous
improvement, all of which must be emphasized in the
implementation of TQM in ROCAF.

Top Management Orientation

Who is top management of the ROCAF and what will they
be responsible for ? The highest leadership in an
enterprise or autonomous division who directs all activities
is the top management. The Commander-in-Chief is absolutely
the highest level of management of ROCAF while the
Commanders of Wings or Stations are top management at their
levels. Because of geographic separation and divisions by
specialty, the Commander-in-Chief has to delegate management
authority to each commander. All top management should
realize the needs and demands of internal and external
customers and develop products and service to satisfy those
customers.

Top management should establish their strategic TQM
planning which consists of activities listed below in line
with Juran:

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. Establish broad organizational goals. Top management should create a clear, positive vision of what the organization is to be in the future.

. Determine the deeds to meet the goals. The initial strategies could select an improvement opportunity which is not troublesome for most people and achieved easily in an organization.

. Organize assign responsibility for doing those deeds

. Provide the necessary resources to meet those responsibilities. Top management should put top priority on quality improvement. The TQM training budget, if possible, should not be sacrificed for any reason. The investment should be spent on those improved technologies, environments and processes which will yield long term benefits.

. Provide the needed training

. Establish reliable methods of measurement to evaluate performance against goals

. Establish a feedback/control system to review the performance against goals.

Top management must have awareness of and commitment to the philosophies and activities of quality management. They should not give lip service only. Involvement and participation of top management is critical. Top management should spend time visiting Quality Improvement Teams or teaching courses in their own organization. Through this

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participation, the real quality problems could become apparent to top management. Top management must make conscientious efforts to provide an atmosphere of mutual respect to drive out employee fear. Under this atmosphere, employees will be inspired through extrinsic and intrinsic satisfaction to devote their efforts on their job.

TQM Structure Establishment

Military organizational structures which look like a pyramid and possess multiple organizational levels, are not appropriate for TQM implementation. When practicing TQM, top management should allow delegation of authority through decentralization which decreases vertical strings and increase horizontal communication, coordination and cooperation of all organizational levels. During wartime, the command system of a military organization has the function of uniting the entire force under one command. The current military organization,therefore, has value and should be preserved until a new system results through TQM evolution. Many organizations overlay the TQM organization onto the existing management structure. Using the existing structure gives a great opportunity for participation by existing authority and avoids resistance and disruption in the organization.

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TQM is a way of continuous improvement, but abrupt revolution; without the commitment of top management TQM cannot succeed. A popular TQM structure for most organizations is composed of three levels, which are the Quality Council, Quality Management Board and Process action teams. Under this structure, the three levels are separated by their functions— strategic, tactical, and operational. Each member of a top-level serves as chairperson of a lower level. In each level, the horizontal linkage consists of different functional departments serving as cross-functional teams. The Quality Assurance Department could serve as a Quality Staff for the Quality Council for overall organizational specific quality assurance support (see Figure 18).

This type of structure which offers a number of benefits to the organization is in line with U.S. Federal Quality Institute:

. It helps the organization focus on the same goals without changing the current organization.

. It promotes better teamwork and decreases internal competition.

. It improves vertical and horizontal communication throughout the organization to reach the common goal.

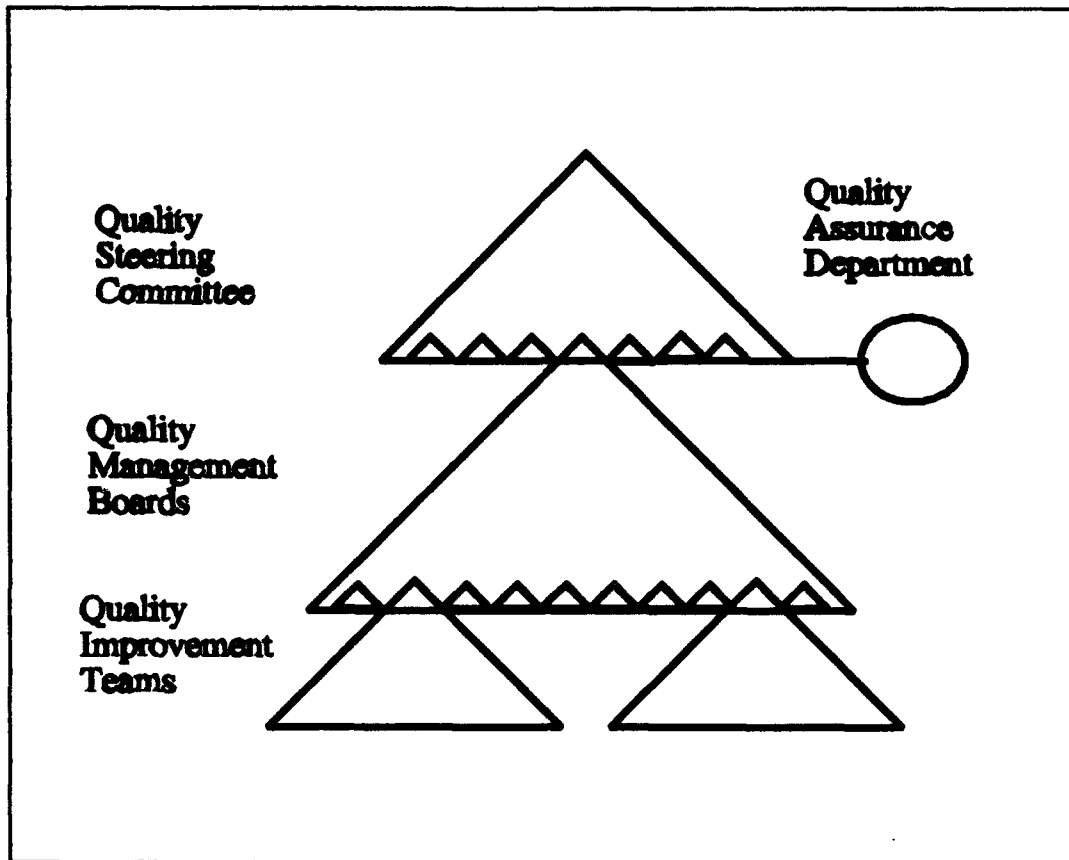. It cultivates the organizational culture by replicating ideas and standardizing solutions (FQI, 1991:21).

Figure 18. TQM Organization Structure

Quality Steering Committee (QSC). The Quality Steering

Committee, sometimes called the Executive Steering

Committee, Executive Steering Group or Quality Council,

consists of the organization's top management. The Quality

Steering Committee is headed by the organization Head or

Deputy; the membership of the Quality Steering Committee

consists of the highest level management in the

organization. The Quality Steering Committee concentrates

on quality strategy rather than quality techniques. A

nation-wide organization could replicate the Quality

Steering Committee used at the National Headquarters throughout the subordinate geographical units.

It's functions include:

. identifying the organization's vision, strategic improvement goals, and guiding principles for overall TQM improvement effort

. establishing TQM organization structure

. reviewing and selecting quality improvement projects from Quality Management Board.

. providing support and resources (staffing, training, funding and equipment) for

- Infrastructure and education

- improving process changes

- Recognition/reward system for improvement efforts

. develop a feedback/control system for tracking the progress of all quality improvement projects

Quality Management Boards (QMB). QMBs comprise cross-functional teams of top and middle-level managers who are responsible for each functional division in the organization. The members in the QMB should, at least, have general functional process knowledge of products and services, and possess enough positional power to influence and secure support and necessary change.

QMBs' functions include:

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. apply continuous improvement practices to analyze and
resolve the majority of process problems which are assigned
from the QSC

. recognize and define quality indicators to identify and
correct common/systemic causes of process problems in the
organization

. organize Quality Improvement Teams to find specific issues
and resolve them

. Track process performance to help Quality Improvement
Teams solving problems

. perform as a coordinator among QSC and QITs

Quality Improvement Teams (QIT). Quality Improvement
Teams are comprised of persons from any hierarchical level
who have a thorough knowledge in a specific aspect of the
process under consideration.
QITs' functions include:

. assist the QMB by collecting and summarizing process data
for specific a issue/problem

. highlight special causes of problems by collection and
analysis of key process variables

. identify and recommend specific areas for improvement to
QMB.

Quality Assurance Department (QAD). The members of QAD
should include some Quality Assurance expertise which
includes the ability to perform statistical analysis. The

role of QAD is an assistant to the entire organization for specific problems which usually rely on statistical support. QAD is organized to cultivate statistical analysis ability for everyone but not the unit which is solely responsible for problem solving.

QAD's functions include:

. Provide staff support regarding statistical theory and techniques for QSC

. serve as in-house consultants, facilitators and instructors to support TQM training.

TQM Education and Training

TQM makes all employees responsible for quality. Employees must all be given commensurate authority to take action when quality problems are detected. Training can be conducted in a variety of forms including university courses, special seminars, and on-the-job training; and should address improvement philosophies, problem-solving techniques and team interaction skills.

The following general guidelines and goals for TQM education and training are in line with U.S. DOD. The general guidelines for TQM education and training include:

. the education and training program should be highly flexible and tailored to general organizational culture

. the top-down commitment should be visible from participate activities

. the continuing cycle of education will never stop.

The TQM vision of ROCAF will be reflected in its education and training goals:

Long-Range Goals.

. All ROCAF personnel will learn and know TQM principles and techniques.

. TQM will be integrated into related ROCAF management and technical education and training courses.

. ROCAF will offer support and resource to the TQM education and training courses.

. ROCAF should welcome private and public education businesses to share with ROCAF TQM education and training.

. TQM education and training should be major considerations for choosing the prime defense contractors with ROCAF.

Mid-Range Goals.

. Top management will receive TQM education and training.

. An education and training program for TQM instructors, facilitators and statistical experts will be in operation.

. Training program and material will be developed and provided to TQM users.

. TQM curriculum will be integrated into training materials for all management and technical courses.

. TQM education and training will be integrated into career development channels.

. A ROCAF resource center will be in operation.

. ROCAF will implement plans to encourage the involvement of private and public education businesses.

Short-Range Goals.

. A TQM education and training plan will be developed.

. A survey of existing TQM education and resources in both the private and public sectors will be conducted.

. Personnel in top management and involved with managing and facilitating the TQM effort and course developers will be educated.

. A plan will be developed for training curriculum developers.

. Curriculum developers will be chosen and educated in TQM methodology.

. A plan will be developed to review and evaluate existing management and technical training courses to ensure that which course should be integrated with TQM.

. Career development planners will design how best to integrate TQM Education and training into career development channels.

. A ROCAF TQM resource center that can network with other resource centers will be established.

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. A strategy and plan for encouraging private and public education systems will be developed

Continuous Improvement (CI)

Continuous Improvement allows team members under the limited materials, labors, and budget through depth discussion and open suggestion to breakthrough the problems step by step. Implementation of TQM requires that management adopt a strategy for integrating the practices and procedures of improvement in an organization.

In applying continuous improvement in the ROCAF, the following continuous improvement model is recommended. The elements of the CI model are abstracted from the traditional Chinese culture and are well-known to ROCAF personnel. This model is divided into three categories: organization improvement, individual improvement, and work improvement.

Organization improvement. TQM demands the entire organization's involvement in the quality improvement effort. Thus, organizational improvement emphasizes holistic improvement of different relationships including superiors and subordinates, personnel and things (works), and producers and customers (see figure 19). The relationships between superiors and subordinates are cohered by practicing jen (benevolence) and performing yi (righteousness). The relationships between the personnel

and things are improved through the individual improvement and work improvement. The relationships between the producers and customers are improved by fulfilling the chung-ho (optimum-harmony).

Practice Jen (Benevolence). Top management should practice jen (benevolence) in their leadership to cultivate the righteous behavior of the entire work force. Top management should provide a vision which is created by considering the benefits to the whole organization and its external customers. Top management should also commit to improving the quality of the work force and suppliers while also committing to improving the quality of the product to meet customer requirements. Superiors should not only drive out the sources of fear but should also show their benevolence to subordinates to encourage innovative thinking and new suggestions. Superiors should create and nurture the TQM environment to support the subordinates' quality improvement activities. Most of the time the cause of a production failure is a common cause which is derived from system's limited capability. Superiors should enable their subordinates through training and empowerment. The establishment of the measurement system is used to recognize and reward the work force. Therefore, the consideration of human factors will be more meaningful to nonprofit services.
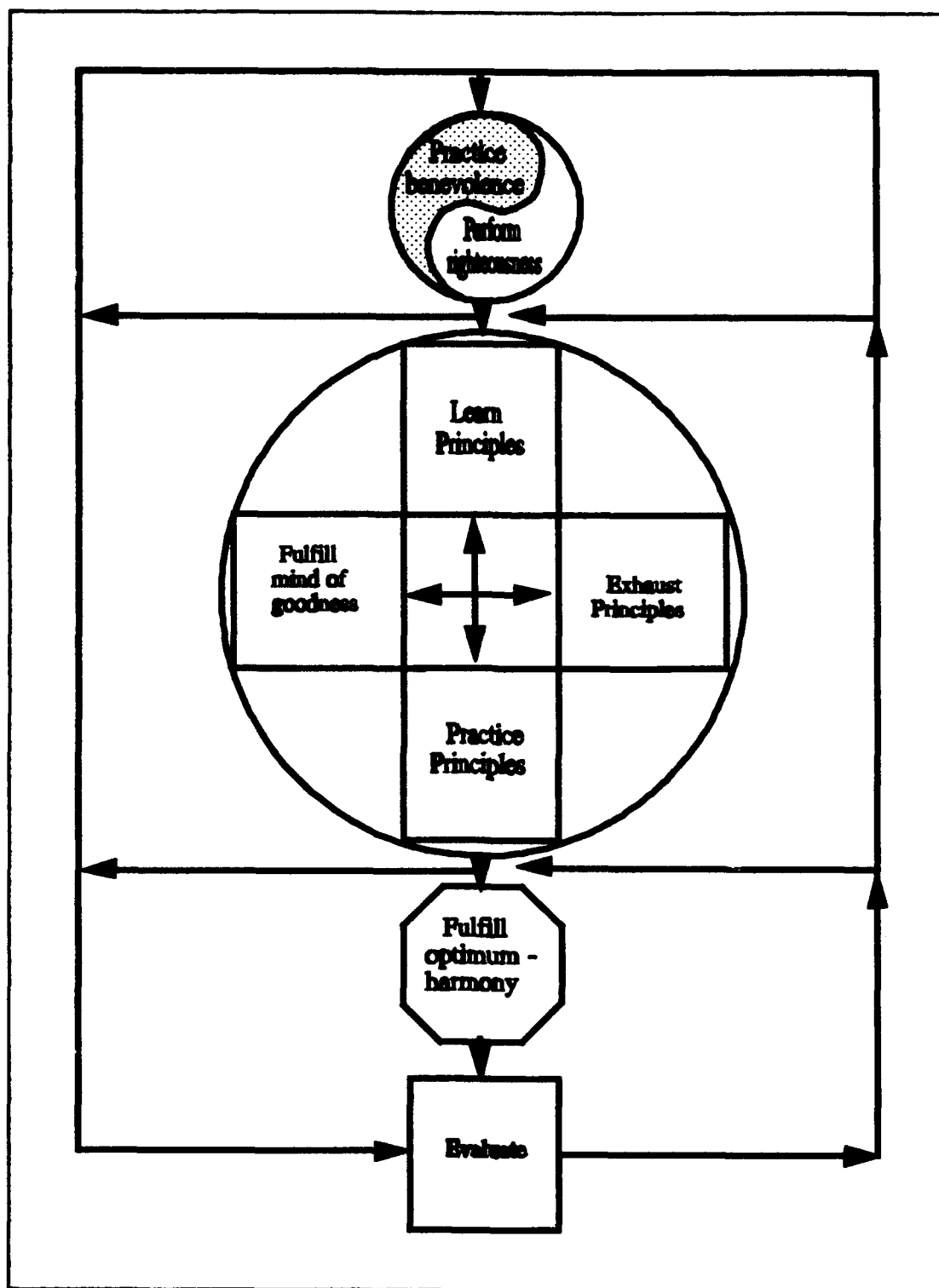
Figure 19. Organization Improvement

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Perform Yi (Righteousness). When superiors practice their jen (benevolence), the subordinates will or should respond righteously. The righteous behavior should be a way to do the daily work, to cooperate with peers, and to be loyal to the organization. A righteous worker will apply expertise to his/her job and realize good performance itself is a reward. Continuous improvement is a step-by-step and disciplined methodology which is accomplished by a disciplined work force.

Learn Li (Principles). Li, the principles of nature, are prepared for us to do things. Without li nothing could be done easily. Top management should make the work force aware of their inabilities and motivate people to find the true principles to get things done. In a TQM organization the principles that need to be learned include the principles of improving the individual and the principles of doing things. Because TQM relies on employees focusing on continuous improvement and demands individual improvement and work improvement, the entire work force should know the appropriate principles to fit into their job. Learning li is the basis for behaving appropriately, for exhausting principles logically, and for practicing principles firmly. Benchmarking from successful organizations is one way to start the learning li.

Fulfill Liang-Chih (the Mind's Knowledge of

Goodness). Liang-chih, the mind's knowledge of goodness, is

the conscience of people, which can judge the rightness or
wrongness of their own behavior. In any modern industry,
because of specialization the employer lacks full knowledge
about the job faced by the employees and cannot know how
well the employee performs the assigned job. Thus, the
employee may do some partial work for his own ends rather
than for those of the employer. The employer may hire
managers to monitor those employees, but they cannot monitor
perfectly. As such, top management should educate employees
to pursue their intrinsic success and create a culture for
broad human well-being. Only the individuals of the
organization who fulfills their liang-chih then their deed
will show good performance. Nothing is better than that top
management win the mind of employees. When individuals
fulfill their liang-chih they are more willing to learn li
(principles), exhaust li, and practice li.

Exhaust Li (Principle). Learning li is the basis
of exhausting li while exhausting li stimulates the need to
learn more. If one only learns li and ignores exhausting
li, one cannot solve problems independently. Exhausting li
is the method of work improvement which depends on the
learned li to innovate or deduct new ways to work
improvement. Exhausting li relies on fulfilling lian-chih

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as a guide which leads individuals to good and prevents scientific progress from being used for evil. The results of exhausting li broaden and deepen the mind of goodness (lian-chih) which is confirmed by exhausting li and makes one more confident to fulfill such lian-chih on other things. The exhausting li enables one to practice li more firmly.

Practice li (Principles). Practicing li is the best way to inspect the learned li, the fulfilled liang-chih (the mind's knowledge of goodness), and the exhausted li. Practicing li is the application of learning li, the performance of individual improvement, and the operation of work improvement. During practicing li, the knowledge and action are united and give feedback to the above three steps. During practicing li, the organization's vision is fulfilled, the individual's liang-chih is motivated, and the truth of exhausting principle is found.

Fulfill Chung-Ho (Optimum-Harmony). Chung-ho is the state of things at their stable optimum situation. Chung (Optimum), in relation to time, it is doing things at the right time; in relation to the position, it is doing thing at the right place; in relation to the quantity, it is doing thing at the right amount. Ho (harmony), in relation to the organization, is creating harmonious relationships among personnel; in relation to customers, is satisfying the

quality of products or services. Applying Chung-ho to products an, services, offers the best combination to producer and customers. The entire effort of TQM is to reach the situation of chung-ho which satisfies the customers' requirements and the producer's goal.

Evaluate. Evaluation should not wait until the last moment. Instead it should be applied to each step as early as possible to eliminate errors or defects while they are still small. Most of the time a deteriorating relationships between superiors and subordinates is the cause for inferior products. If all the people in the organization perform their duty to the best of their ability there is less a chance for doing things wrong. If superiors can practice their jan (benevolence), the subordinates can behave their yi (righteousness), and the defects still do not decrease, we need to evaluate our applied principles to find more appropriate principles for our system. If our products meet our requirements but are not accepted by our customers, we should enlarge our vision of jan to include the customers' well-being in our system.

Individual improvement. Clearly, each individual is a part of the entire work force, and individual improvement affects the success of organization improvement and interacts with work improvement. Individual improvement is

ignited by self-awareness and also can be stimulated by education and training, which is of supported by the organization or worker themselves. The individual improvement model (see Figure 20) is a part of organizational improvement. It includes the fulfilling lang-chi (mind of goodness) to guide the improvement, the practicing principles to do the improvement, the fulfilling optimum-harmony to get things done correctly, the evaluation of the individual improvement, and the education of learning principles.

Fulfill Lain-Chi (Mind of Goodness). When our mind is not in harmony and when our performance is not optimal, our lain-chi (mind of goodness) can tell us what is going wrong. Only one who knows his inability and feels shame with his inabilities can ignite his individual improvement by himself. Without self-awareness, it is not easy to get individual improvement done. Only when we fulfill the mind of goodness can we find our inability and analyze the causes of problems to improve our goodness. In fulfilling lain-chi stage, we can improve ourselves in at least three areas.

Perform Li (Propriety). If lain-chi (mind of goodness) is the truth for individual improvement then li (propriety) is the best way to for an individual perform. Li is an appropriate way to do things through moderation. Li
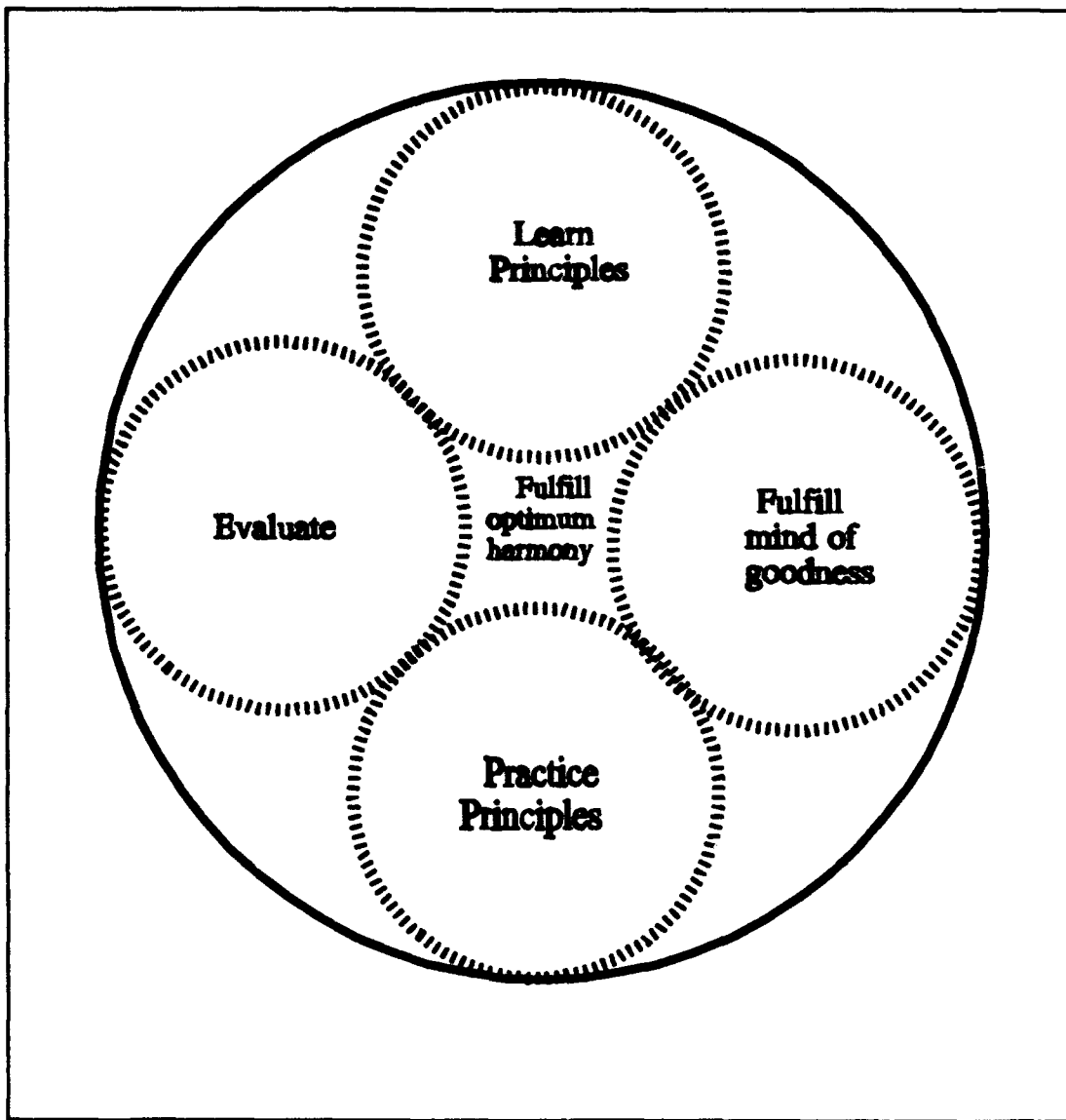
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Figure 20. Individual Improvement

(propriety) is rooted in the humble mind. An individual

with a humble mind knows how to respect himself, how to

cooperate with others, and how to devote loyalty to his

organization.

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Build Hsin (Trust). TQM relies on teamwork, and builds hsin (trust), which is an important step for teamwork. Hsin (trust) should start from ourselves and be accomplished through helping one another. Through Hsin (trust), the commitment to subordinates is promised, the reputation to peers is established, and the requirements of customer are satisfied.

Devote Chung (Loyalty). In fulfilling lain-chi stage, we should select and create goals which align with the organizational vision for self-realization. To devote chug to our organization is a way to recognize our current work and a way to believe what our doing is worthwhile. Only those employees loyal to their work will win their customers' loyalty.

If we could not fulfill lain-chi by ourselves we need to accept training and education, or the organization should support the individual in learning Principles stages.

Practice Li (Principles). Practicing li (principles) promotes the unity of lain-chi (mind of goodness) and action. Self-improvement can be performed through li (propriety) which guides the individual to behave in the correct ways. Li (propriety) is a way to show one's dignity by fulfilling his lain-chi (mind of goodness), to help people through appropriate support, to behave loyally to the organization by doing his job correctly and diligently.

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Fulfill Chung-Ho (Optimum-Harmony). The purpose
of individual improvement is to fulfill chung-ho (Optimum-
harmony) of one's mind or one's jobs. Individual
improvement cannot occur by ignoring the importance of
coordination with the outside environment. Optimum
performance should be confirmed with job requirements and
harmony should be shared with the entire organization.
Personal goals should be harmonized with the organization,
superiors, peers and customers.

Evaluate. At the end of the period or project we
set for our individual improvement, we measure the results
by our goals and our preset measurements. If something
beyond our measurements, we shall rely our lang-chi (mind of
goodness) to ask ourselves whether we feel chug-ho (optimum-
harmony). If we could not fulfill optimum-harmony under the
learned principles, we should go further to the next stage,
learn principles, to empower ourselves again.

Learn Principles. The more we learn the more we
know what we really want. Employees may not be willing to
learn automatically. That maybe because they have not found
the joy of learning. Top management should support training
and education by consulting support but not by force. The
entire organization should be under the atmosphere of
research and study which is ignited by top management and
conceived by subordinates.

Work improvement. Work improvement is the continuous improvement of daily work and directly affects the results of product or service quality. Work improvement is a part of organizational improvement and guided by a preset vision of organization. Work improvement strongly relies on the employees' involvement, thus, the individual improvement deeply affects the success of work improvement. Work improvement (see Figure 21) includes exhaust principles, practice principles, fulfill optimum-harmony, evaluate, and learning principles.

Exhaust Principles. Exhausting principles is a step-by-step improvement which continuously researches and studies the problems down to their smallest element. In the exhaust principles stage the focus must on the following steps.

Analyze problems. Identify problems from the feedback of fulling chung-ho (optimum-harmony) stage which recognizes the satisfaction of internal and external customers. Analyze the possible cause and critical causes of the problem.

Establish improvement projects. The improvement project is established under the directives of top management and distributed to each level of the organization to develop their improvement goals. In this stage, the missions of each TQM organization level are
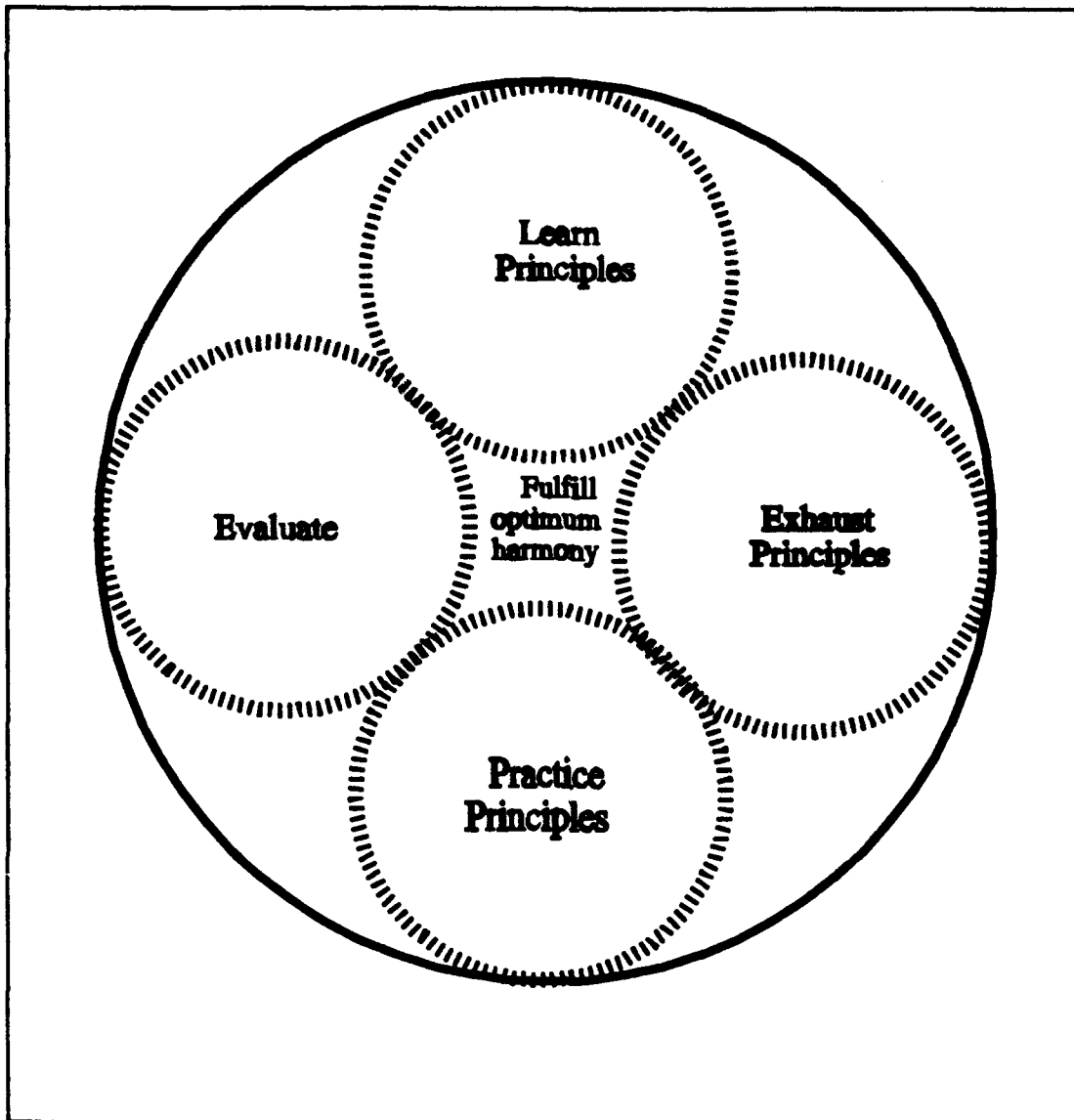
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Figure 21. Work Improvement

assigned and developed by their functions.

Implement improvement project. This stage
includes the following steps.

Set Measures of Performance. The
measures of performance are identified and set for improving

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the process of work. All components of the process should have related measurement for their performance.

Exhaust improvement opportunities. Under limited budgets, labor, and technology, team members should try desperately to find possible ways for eliminating the causes of problems.

Synthesize improvement methods. After desperately struggling for the possible improvement opportunity the results should be calmly synthesized to form a standard method for implementation.

Practice Li (Principles). The new standard method resulting from exhausting principles stage should be tested through the practicing li (principles) stage to make sure such a theoretical method can be done in the real process.

Fulfill Chung-Ho (Optimum-Harmony). The result (product or service) should confirm the requirements of customers and be accepted by all (internal and external) customers.

Evaluate. Evaluation of each person's own subjective attitude should occur at each stage in order to find defects as early as possible. The collected results of each stage should be evaluated, and the evaluated results will be sent to each level to get feedback as early as possible.

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Learn Principles. If, after the above stages, the customers' requirement still cannot be satisfied, the entire quality improvement team should learn more principles from competitors, consultants, and customers. Most of the time, the learning principles stages can save an inexperienced producer time and budget if he will benchmark other competitors as early as possible.

The Relation Between Individual Improvement and Work Improvement. Individual improvement and work improvement interact with each other (see Figure 22). When we improve
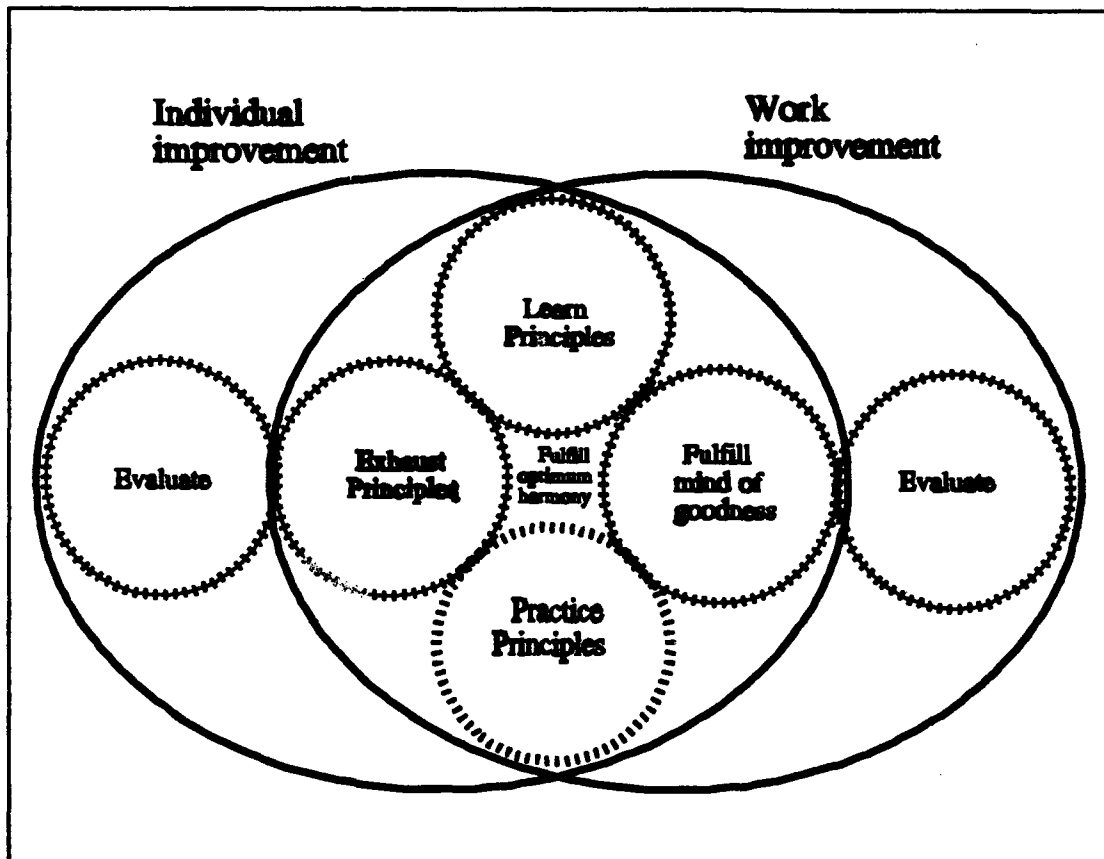

Figure 22. The Relationship Between Individual Improvement and Work Improvement

ourselves, we fulfill our lang-chi (mind of goodness), and
this mind should not be restricted in a narrow vision. The
reasons we try to improve ourselves are that we try to
enable ourselves to improve our work and through work
improvement, individual improvement confirmed side by side.
Thus, the individual improvement and work improvement share
the same stages: the learning principles and the practicing
principles which cultivate and accomplish the two
improvements. The communication between fulfilling lang-
chih (mind of goodness) and exhausting li (principles)
stages, enables us and our customers to fulfill chug-ho
(optimum-harmony).

The Relations Among Organization Improvement,
Individual Improvement, and Work Improvement.
Organizational improvement creates a healthy environment and
motivates the entire work force to start their individual
improvement and work improvement. Individual improvement
and work improvement strengthen and maintain the success of
organization improvement. Those three improvement cycles
interact with one another (see Figure 23). If one of them
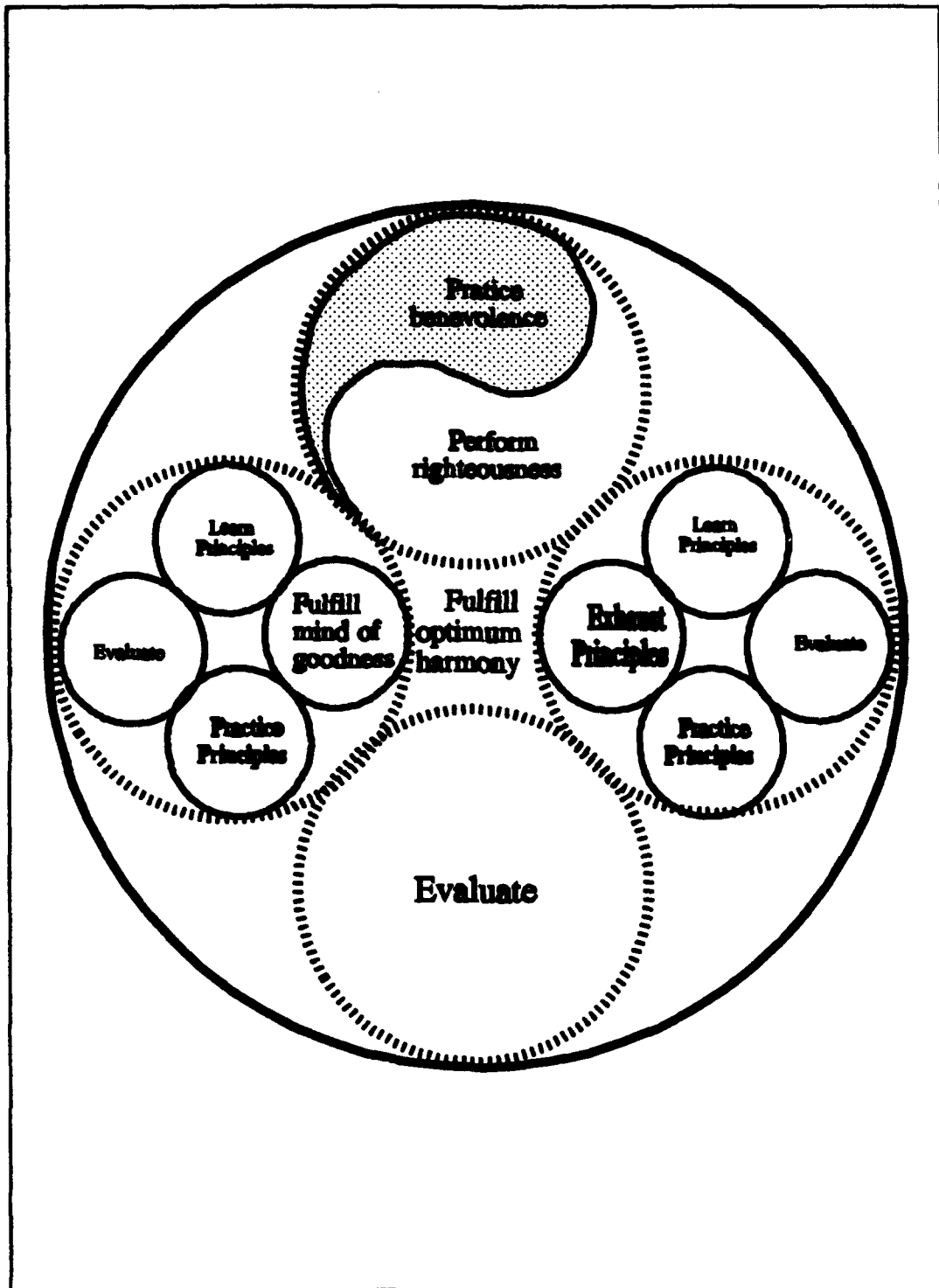stops its improvement, it will stop the other improvements
as well.

Figure 23. The Relationships Among Organization
Improvement, Individual Improvement, And Work
Improvement

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Conclusion

This entire research effort developed according to its objectives. In literature review, the TQM elements and advantages were reviewed through definitions of quality, the advantages of TQM, the principles of quality, TQM tools and techniques, the education and training for TQM, and the continuous improvement models. Analysis of the experience of the successful quality improvement organizations gives the ROCAF good lessons to learn and saves a lot of time in starting the implementation of TQM plan. In analysis of the characteristics of the ROCAF, the primary Chinese thoughts were examined and related cultural changes are recommended. The key steps in implementing the ROCAF TQM plan were recommended in the plan for implementation of total quality management in the Republic of China Air Force.

Finding. In analysis of the traditional Chinese culture, the ancient Chinese sages have identified abundant cultural assets which guide peoples' minds and cultivate peoples' abilities to pursue a quality life. The ancient Chinese wisdom has created many innovations and established a glorious human history, and the recent democratic ROC government has a good chance to improve the people's life by promoting the quality improvement.

In aligning the Chinese culture a continuous improvement model is recommended to ROCAF in this research.

This model tries to develop the traditional cultural assets while pursuing modern quality improvement. The ROCAF should put more emphasis on those traditional positive attributes and develop an ideal environment for TQM culture. The ROCAF top management should put more weight on the human factors than the technology only.

Recommendations for Future Research. Were the ROCAF to adopt the implementation of TQM, the possibilities for future research topics will be many. Methods for advanced research in this area could include validation of TQM in ROCAF, evaluation of philosophies applied in ROCAF units, the examination of readiness issues within ROCAF after TQM implementation, or virtually anything else that may have changed following TQM implementation.

APPENDIX A: DOD Posture on Quality

- quality is absolutely vital to our defense, and requires a commitment to continuous improvement by all DOD personnel.

- A quality and productivity oriented Defense industry with its underlying industrial base is the key to our ability to maintain superior level of readiness.

- Sustained DOD wide emphasis and concern with respect to high quality and productivity must be and integral part of our daily activities.

- Quality improvement is a key to productivity improvement and must be pursued with the necessary resources to produce tangible benefits.

- Technology, being one of our greatest assets, must be widely used to improve continuously the quality of Defense systems, equipments and services.

- Emphasis must change from relying on inspection, to designing and building quality into the process and produce.

- Quality must be a key element of competition.

- acquisition strategies must include requirements for continuous improvement of quality and reduced ownership costs.

- Managers and personnel at all levels must take responsibility for the quality of their efforts.

- Competent, dedicated employees make the greatest contributions to quality and productivity. They must be recognized and rewarded accordingly.

- Quality concepts must be ingrained throughout every organization with the proper training at each level, starting with top management.

- Principles of quality improvement must involve all personnel and products, including the generation of products in paper and data forms.

APPENDIX B: <u>Roadmap to Total Quality Management</u>

A Three Phase Approach

Developed by Major Kenneth R. Jennings,

Air Force Institute of Technology

Wright Patterson AFB OH

I. The Assessment and Planning Phase

<u>Milestone 0--Readiness Review</u>

<u>Purpose</u>: Initial assessment of the readiness of the client organization to undertake a comprehensive Total Quality Management process.

<u>Outcome</u>: Clarification of the scope of the TQM process in client organization. Identification of key areas for change. Negotiation of AFIT-client responsibilities and expectations.

<u>Delivery Mode</u>: AFIT team on-site with diagnostic instruments and checklists. Debriefing and planning with senior management.

<u>Milestone 1--Executive Education</u>

<u>Purpose</u>: Introduction of the philosophy and tools of the TQM process to the senior management group.

<u>Outcome</u>: Comprehensive understanding of the role of senior management and directing a TQM effort. Initiation of improvement efforts selected senior management processes.

<u>Delivery Mode</u>: AFIT on site assistance, and either QMT 082 or Executive overview presentation by AFIT Team.

<u>Milestone 2--Strategic Planning</u>

<u>Purpose</u>: Development of comprehensive plan to integrate TQM into every aspect of the client organization.

<u>Outcome</u>: Interlocking strategic and sub-unit operational plans to implement and promote TQM. Formation of TQM steering committees, process action teams (PATS). and corrective action teams (CATS).

<u>Delivery Mode</u>: Consulting Module--AFIT team;, Senior management, and selected support personnel at a suitable meeting location.

II. The process Management and Breakthrough Phase

<u>Milestone 3--Process Ownership and Definition</u>

<u>Purpose and Outcome</u>: Selection and training of individual "owners" for critical organizational processes, along with the associated process action teams. These owners, in concert with process action teams, have the responsibility and authority to improve cross-functional processes. In defining processes, the process owner and the PAT identify the following: internal suppliers and customers, measurable indicators of quality and service to internal customers, and critical process variance points. This definition forms the framework for the further phases of process management.

<u>Delivery Mode</u>: AFIT Process Management Training

<u>Milestone 4--Process Simplification, Measurement, and Control</u>

Purpose and Outcome: Training of the PATs in techniques to simplify, measure and control their respective process in an ongoing manner. Outcomes include process streamlining, measurement systems development, and formal control procedures.

Delivery Mode: AFIT Process Management Training and completion of QMT 084.

Milestone 5--Process Improvement

Purpose and Outcome: Training of the PATs and relevant support groups in techniques to improve the processes in an ongoing manner.

Delivery Mode AFIT Process Management Training and completion of QMT 084.

Milestone 6--Breakthrough Projects

Purpose and Outcomes: Corrective Action Teams (CATs) trained in advanced and specialized problem solving techniques. The CATs are directed by the steering committee toward solving selected high payoff quality, service and performance problems.

Delivery Mode: Under development at this time.

III. The Institutionalization Phase

Milestone 7--Information and Measurement System Design

Purpose and Outcomes: Development or modification of information and measurement systems to reinforce and support ongoing TQM. Systems are designed to deliver needed

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information directly to those closest to the points of process control. Systems are relatively complete cross-functional processes. Target systems include: Management Information Systems, Decision Support Systems, Inventory control Systems, Expert Management Systems, and Variance Measurement and Reporting Systems.

Delivery Mode: To be developed.

Milestone 8--Job and Task Design:

Purpose and Outcomes: Realignment and restructuring of the organization's basic job and task design to form relatively permanent teams to manage complete processes. This will require a graduated change from strictly functional organizational structures to process related structures. The result will be reduced barriers to management and increased work process capability.

Delivery Mode: AFIT Consulting Team on-site.

Milestone 9--TQM Evaluation

Purpose and Outcome: comprehensive evaluation of the attitudes, actions, systems and supports critical to the ongoing success of Total Quality Management. Results of the evaluation are fed back to the client organization for action planning.

Delivery Mode: AFIT consulting team using various organizational evaluation techniques.

Mansir, Brian E. and Nicholas R. Schacht.
"An Introduction To The Continuous Improvement
Process: Principles and Practices."

ORGANIZATIONAL TRANSFORMATION MODEL ELEMENTS

Envision and enable
  Recognize the need to change
  Use outside consultants to start
  Develop internal facilitator
  Form a Steering Committee
  Educate members in philosophy
  Establish a vision for organization
  Develop a business strategy
  Prepare mission statement
  Prepare information package
  Make a long-term commitment
  Demonstrate top-management commitment
  Make time for improvement a policy
  Conduct an internal assessment
  Relate principles to organization
  Examine policies and practices
  Examine communications processes
  Open communications channels
  Remove obvious barriers to improvement
  Eliminate systemic sources of fear
  Create a conducive environment
  Examine and improve support systems
  Align reward and recognition
  Conduct an external assessment
  Establish a customer focus
  Understand customer needs and expectations
  Encourage individual effort
  Establish an effective suggestion system
  Stimulate creative thinking
  Empower individuals to make a difference
  Enable individual improvements (see individual model)
Focus
  Develop an improvement plan
  Establish goals and objectives
  Develop top-level measurement system
  Inform and involve everyone
  Disseminate information package to everyone
  Discuss CIP throughout organization
  Deploy goals and objectives into organization
  Involve customers and suppliers

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Learn
  Define learning needs
  Develop learning systems
  Determine learning methods
  Obtain learning materials
  Teach just in time
  Teach on the job
  Let supervisors teach subordinates
  Provide learning staff support
  Make learning a high priority
  Recognize and reward learning achievement
Team build
  Cultivate leadership
  Select QMB members
  Establish purpose for QMBs
  Form QMBs
  Create cross-functional teams
  Create special teams
  Train teams
  Designate team leaders
  Remove team obstacles
  Form process-improvement teams
  Train improvement teams
  Use improvement projects
  Integrate natural work-group teams
  Recognize and reward CIP behavior
  Support continuous improvement
Improve
  Employ a disciplined methodology (see process model)
  Initiate improvement cycle activity
  Develop process/team measurement systems
  Define and standardize processes
  Gain control of processes
  Simplify processes
  Improve processes
  Eliminate non-value-added activity
  Make processes foolproof
  Focus on upstream processes
  Apply simultaneous engineering concepts
  Apply robust design development concepts
  Focus on system inputs
  Apply just-in-time concepts
  Focus on organizational systems
  Apply cellular processing concepts
  Apply leadtime reduction concepts
  Focus on system outputs
  Apply inventory reduction concepts
  Focus on downstream processes
  Apply timely feedback concepts
Evaluate

Measure organizational performance
Assess and analyze data
Evaluate improvement results
Assess progress
Recycle improvement effort

PROCESS-IMPROVEMENT MODEL ELEMENTS

Set the stage for process improvement
  Create the environment
  Select the improvement team
  Train the improvement team
  Educate about improvement tools
  Discuss mission statement
  Discuss quality issues
  Set ground rules and logistics
Select a process to improve
  Identify opportunities
  Localize the problem
  Create an improvement plan
  Establish operational definitions
  Establish team objectives
  Identify key measures
Define the process
  Describe the process or problem
  Flow chart the process
  Identify supplier/customer relationship
  Identify measures of performance
  Relate measures to customer needs and expectations
  Assure capable measurement system
Standardize the process (SDCA)
  Standardize
      Standardize procedures
      Assess process stability
      Reduce variation in measure system
      Assure controlled measure system
      Analyze special causes of variation
      Correct special causes
      Bring process under control
      Document the standard
      Communicate the standard
      Promote the standard
  Do
      Train to the standard
      Enable the standard
      Enforce the standard
  Check
      Measure results to the standard

Respond to deviation from the standard
Identify root causes
Analyze common causes of variation
Act
Reduce variation in process
Prevent recurrent deviation from standard
Document standard improvements
Revise the standard
Tighten the Process
Assess process capability against requirements
Streamline the process
Error-proof the process
Straighten-up the work area
Eliminate unnecessary equipment
Institute total productive maintenance
Document lessons learned
Collect and maintain process-performance data
Improve the process(PDCA)
Plan
Develop questions
Develop a theory
Analyze available process data
State a goal
Plan a change or test
Design system changes
Define expected outcomes
Identify process measures
Plan data collection strategy
Establish a test measurement process
Test and refine data collection
Do
Train to the plan
Enable the plan
Conduct cause-and-effect analyses
Carry out the change or test
Follow the plan
Experiment with process changes
Check
Observe/collect the data
Analyze the data
Look for pattern in data
Compare data with theory
Respond to deviations from plan
Identify root causes
Determine type of cause
Correct special causes immediately
Look for alternative solutions
Determine impact on outcomes
Determine whether objectives are met
Determine whether theory needs revision

```
        Summarize what was learned
    Act
            Prevent recurrent deviation
            Redesign products or processes
            Implement permanent change in the process
            Continue to collect and analyze data
            Document and standardize the change
            Continuously monitor the process
    Develop a strategy for further improvement
    Repeat SDCA and PDCA cycles
Assess improvement performance
    Organize data
    Document project results in picture book format
    Make final presentations of PDCA story
    Evaluate team methods
    Evaluate project results
    Recommend follow-up activity
    Celebrate PDCA cycle completion
    Recognize and reward CIP behavior
    Select a new process to improve
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INDIVIDUAL-IMPROVEMENT MODEL ELEMENTS

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Envision personal improvement
    Cultivate your self-awareness/image
    Develop behavior/expectation matrices
            Assess your relationship with supervisor
            Assess your relationship with peers
            Assess your relationship with subordinates
            Assess relationships with union
            Assess relationships with customers
    Evaluate your need/desire to improve
    Create a personal vision for improvement
Enable personal improvement
    Improve your education
    Study concepts
    Attend conferences
    Pursue training just in time
    See your job as learning experience
    Learn to use the CIP tools
    Learn to measure and understand processes
    Learn to use data to support your decisions
    Learn to differentiate data and information
    Seek support for your improvement effort
Focus on improvement
    Examine your mission
    Establish goals and objectives
    Communicate your goals
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Develop a personal-improvement strategy/plan
Create job outcome/CIP behavior matrix
Describe your behaviors vis-a-vis subordinate
Perform a personal signal analysis
Make improvement a high priority
Make time in your schedule to improve
Organize your activity to make improvement possible
Recognize your responsibility to improve
Take advantage of learning opportunities
Improve your job
Define your job
Recognize the processes you own
Address your job processes
Understand how your processes link to others
Understand the capabilities and limitations of your
    processes
Know your customers
Understand their needs and expectations
Establish routine dialogue with them
Identify problem areas in your job
Address critical areas first
Use a systematic approach to improvement
Remove complexity and simplify your job
Pursue small incremental improvements
Improve your behavior
Constantly challenge your behavior
Demonstrate leadership
Demonstrate commitment
Take initiative
Take long-term view
Set an example
Maintain self-control
Align your activities with your goal
Continuously pursue your goals
Expect improvement in yourself
Make personal improvement a routine
Become a good team player
Poster cooperation
Foster communication
Be observant
Become a good listener
Open up your communication channels
Remove the barriers you erect
Work to eliminate your fears
Don't be unduly critical of yourself
Pursue innovative thinking and new ideas
Eliminate roadblocks
Trust and deserve trust
Help other improve
Make time in your schedule to help others improve

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Involve others in decision processes
Train others
Coach and nurture
Create more leaders
Facilitate teamwork
Help remove others' barriers
Learn what questions to ask and how to ask them
Encourage small improvements by others
Support implementation of subordinate's ideas
Welcome the news of problems as opportunities
Expect improvement in others
Help remove the sources of others' fears
Welcome the new ideas of others
Evaluate your improvement
Recognize the value of correct effort versus results
Judge others fairly and correctly
Don't be unduly critical of others
Document improvement in an improvement journal
Celebrate your successes
Celebrate the successes of others

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13. ABSTRACT (Maximum 200 words)

The purpose of this study is to build a plan for implementation of Total Quality Management in the Republic of China Air Force. The primary TQM elements are reviewed through definitions, advantages, principles, tools and techniques, education and training, and continuous improvement. In order to establish a TQM plan, the related experience of quality improvement in the U.S. DOD are referenced. The characteristics of ROCAF related to TQM are analyzed and related culture issues are mentioned. The implementation plan includes four parts, top management orientation, TQM structure establishment, TQM education and training, and continuous improvement. A Chinese view of TQM continuous improvement models is recommended in this research. As a result of this research, the author found that the thousands of years of traditional Chinese culture have great potential for Total Quality Management implementation, and the ROCAF should maintain and develop these valued culture assets for quality improvement.

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